PROGRESSIVE MEDICINE

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PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES

EDITED BY

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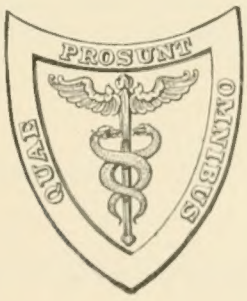
VOLUME II. JUNE, 1909

HERNIA—SURGERY OF THE ABDOMEN, EXCLUSIVE OF HERNIA—GYNECOLOGY —DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE SPLEEN, THYROID GLAND AND LYMPHATIC SYSTEM—OPHTHALMOLOGY.



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PROGRESSIVE MEDICINE.

JUNE, 1909.

HERNIA.

By WILLIAM B. COLEY, M.D.

Hernia Associated with the Undescended or Maldescended Testis. A most valuable paper upon the "Surgical Treatment of the Incompletely Descended Testis" has been published by Rawling.[1]

Rawling's paper is based upon an analysis of 120 cases admitted to St. Bartholomew's during the past five years. Of these, 23 patients were between one and ten years of age, 64 between ten and twenty, and 33 twenty years and upward. In 63 the condition was on the right side, in 50 on the left side, and in 7 double. In none of the latter was the failure to descend equal on both sides.

With regard to the personal history, it is stated that in 30 cases there were more or less pain and discomfort, and in 9 cases acute attacks of severe pain accompanied by nausea, vomiting, and soreness. In some cases the symptoms simulated torsion of the cord. In the great majority of cases, however, the patient came to the hospital for the treatment of a lump in the groin. In 90 per cent. of the cases the condition was associated with a hernia.

Under the age of ten years there was little change in the size of the undescended testis; after puberty, however, there was usually more or less marked atrophy.

On opening up the aponeurosis of the external oblique, the condition usually found was a more or less atrophied testis, the epididymis softer and smaller than normal, some distance away from the testis; the cord was usually enlarged and implanted, as it were, upon the posterior wall of the sac, accompanied by a well-marked mesentery, a voluminous processus vaginalis, the lower pole of the testis usually connected with the base of the scrotum by a well-developed gubernaculum, suggesting some other cause for the imperfect descent of the testis than the failure of the

[1] Practitioner, London, August, 1908, p. 250.

fibers of the gubernaculum to exert their normal traction. The processus vaginalis extended in a number of cases far beyond the testis.

Rawling's paper is extremely valuable for the amount of information it contains as to the actual condition of the imperfectly descended testicle, for the reason that in no less than 50 cases was the testis removed, and in 27 of these a careful microscopic examination was made. In 15 the changes were characteristic of ill-developed and atrophic testes, with an increase of fibrous tissue and deficiency of epithelial elements and defective or absent spermatogenesis. In 10 cases there was little alteration from the normal, and definite spermatogenesis was present; one case showed evidence of tuberculous and one of malignant disease.

The treatment of the condition is discussed somewhat briefly, but yet in a very broad and philosophical manner by Rawling; he divides the treatment into four methods or plans:

1. To place the testicle in the scrotum.
2. To allow it to remain in the canal.
3. To replace it in the abdomen.
4. To remove it.

In four cases all the vessels except the vas and its artery were removed, and in no case did gangrene result.

The globus major was separated from the globus minor in 5 cases and resulted in four failures.

In 21 cases of primary inguinal retention, attempts were made to place the testicle in the scrotum. Of these, 5 returned into the inguinal canal; 6 ascended to the pubic bone; 6 others became pubic scrotal; and 4 only remained in the scrotum.

Of 8 examples of pubic retention, 6 returned to the pubic region and 2 became pubic scrotal.

Of 29 cases, therefore, in which an attempt was made to transplant the testicle into the scrotum, permanent success was obtained in only 4 cases.

Rawling believes that in the remaining 25 cases the condition of the patients was less satisfactory than before operation: (1) Because the testis is more liable to injury in the pubic or pubic scrotal region; (2) because it is more liable to pain and discomfort; (3) because the chances of undergoing malignant degeneration are increased.

As regards the second method of allowing the testis to remain in the canal after curing the hernia, Rawling's chief objection is that the testis in this position is more liable to become sarcomatous, and in proof of this he cites the statistics of R. Hood, who collected 57 cases of sarcoma of the testis observed at the London Hospital within a period of twenty years, of which 9 were examples of undescended testis, giving a percentage of 15.7. He further states that of 54 cases of sarcoma of the testis observed at the Massachusetts General Hospital, 6 occurred in the undescended testis, or 11 per cent., and of 41 cases collected by Schede, 5, or 12 per cent., were in the undescended testis.

From these statistics, he concludes that from 11 to 15 per cent. of malignant disease of the testis occurs in the undescended organ, while the relative proportion of the undescended to the normally descended testis is but 1 to 1000.

Another objection of Rawling to leaving the testis in the canal is that it is liable to produce torsion of the cord.

As to the third method of treatment, *i. e.*, reposition in the abdominal cavity, Rawling's chief objection is that in all cases of abdominal retention the testis loses its power of spermatogenesis.

In the 50 cases in which the testis was removed, there was no difference in the development of the individual or in his procreative function when entering the married state.

This statement, if true, is exceedingly important, but personally I do not believe that Rawling's or any other statistics up to the present time have furnished sufficient data for the expression of such a positive opinion. Rawling states that the entire series of cases were admitted to St. Bartholomew's Hospital during the last five years, a period manifestly too short to determine the effects of the removal of the testis upon the development of those under fourteen years of age, and also too short for any sufficiently large number of the adults to have shown conclusive results in the married state.

Rawling concludes that attempts to place the testis in the scrotum usually result in failure; leaving it in the canal renders it more liable to malignant degeneration and torsion of the cord; and as replacing it in the abdominal cavity destroys all chances of spermatogenesis, there remains then but one method of procedure, *i. e.*, *the removal of the testicle and complete closure of the canal.*

This Rawling regards as the method of choice. He believes that there is a compensatory hypertrophy of the other testicle if this method is adopted, and in certain cases he is sure he has observed it.

In most cases he would not operate before the seventh year, but in all cases after this age and in such cases in which the testicle could not be easily replaced in the abdomen he would remove it, with one exception, *i. e.*, the condition of double undescended testis. In these cases he advises attempting to place the testicle into the scrotum, running the risk of retraction of the testis into the pubic or pubic scrotal region, in order to give the individual the benefit of what chances there are of retaining the functional power of the testicle.

In double undescended testis he advises operation before the age of puberty.

It is much to be regretted that Rawling does not make it clear in more detail what method or methods were employed in the cases reported. As the operations were performed by a number of different surgeons, it is probable that several methods and different technique were used, and one should not hastily conclude from these

statistics that better results could not have been obtained from a different method.

Rawling's position, advocating the routine sacrifice of the testicle in cases of non-descent or maldescent is, I believe, far too radical, and marks a step backward in the treatment of this condition. During the last twenty years a sufficient number of operations for this condition have been performed and traced to final results, to convince one that the sacrifice of the testicle is absolutely unnecessary and, in most cases, unwarranted.

Good results from operation are by no means of recent date. Tuffier,[1] as far back as 1890, in a paper on the "Surgical Treatment of the Undescended Testis,"[1] reported the end results in 11 cases operated upon, 7 by himself and the remainder by his colleagues, by a method which he described in detail. He stated that the surgical treatment of the undescended testis even at that time was not new. Professor Kocher, of Munich, performed an operation for the undescended testis as early as 1820.

Chellius, in 1836, showed that the vessels of the cord were sufficiently long to permit the testicle to enter the scrotum. Later, Annandale, Wood, and Owen, of England, and Max Schüller, of Germany, each operated on a single successful case, and shortly after that Championnière, of France, reported a case.

Bevan in all his articles, 1899 to 1903, refers to the early work of Professor Max Schüller, of Greifswald, Germany, and gives him well-deserved praise for having been probably the first surgeon to propose and carry out a definite operative procedure for the undescended testis. Schüller's article can be found in the *Annals of Anatomy and Surgery*, 1881, p. 89. At this time very few surgeons had begun to perform radical operations even for ordinary cases of inguinal hernia.

I believe that Schüller, like many more recent writers, exaggerated the danger of the undescended testis becoming attacked by malignant disease. He pointed out the unsatisfactory results from any mode of truss treatment, and in view of these results he stated that he felt justified in recommending instead, "for proper cases, the bloody transplantation of the testis into the scrotum."

The operation which he proposed and carried out in one patient, a young man, aged twenty years, in brief consists of practically Czerny's operation for inguinal hernia, *i. e.*, incision over the external ring; the aponeurosis is not cut; with the index finger as a hook, the cord is brought down; traction on the cord by the index finger brings the testicle into view. The vaginal process or sac is cut across transversely, the lower end sutured with catgut over the testicle, making a new tunica vaginalis, and the upper end closed with purse-string sutures, shutting

[1] Gazette des Hôpitaux, 1890, p. 349.

off the abdominal cavity. After dividing the muscular and fibrous coverings of the spermatic cord, he stated that the latter could be drawn down as low as desired without the slightest difficulty, and the "testicle remains down and cannot retract itself." In spite of this, he thought it wise to suture it to the bottom of the scrotum with catgut. He stated that the result was perfect, and the testicle increased in size. The patient was discharged four weeks after operation. Whether or not further observation was made subsequent to this time is not stated.

Tuffier's method (1890) consisted, in brief, in an incision over the upper scrotum, as high as the middle of the canal, full exposure of the vaginal process and its contents, resection of the vaginal process, if it existed, and of its vestiges, if absent; closure of the upper portion of the vaginal process, likewise closure of the lower portion, making a new tunica vaginalis for the testicle; separation of all adhesions; division of the fibrous bands and cremaster muscle; fixation of the testicle in the bottom of the scrotum, and also *fixation of the spermatic cord to the pillars of the inguinal canal.* Tuffier stated that this was a very important step and one of great utility —closure of the canal for the radical cure of the hernia.

Tuffier's results are interesting. All the seven cases were traced. One case, and this the one in which the cord was sutured to the pillar of the inguinal canal, showed a perfect result more than a year after operation. In the other six cases the testicle showed more or less tendency to retract toward the external ring, but none of the patients suffered any longer from pain and discomfort. Of four cases operated upon by Tuffier's colleagues, two showed perfect results.

Considering the fact that these operations were performed twenty years ago, the results must be adjudged as extremely good.

Tuffier concluded that by reason of these results he was forced to disagree with the opinion, previously expressed, that "French surgery must reject an operation which presents only the disadvantages and none of the advantages of castration," and, on the contrary, state his belief that the operation was both beneficent and efficient. French surgeons were the first to accept the teachings of Tuffier and to perform such operations on a large scale, as shown by the paper of Broca.[1] At that time Broca had operated upon 138 cases, of which 79 had been traced from one to six years after operation. He found it necessary to remove the testicle in a single case, and this in an infant in whom operation was done for strangulation, and the element of time was important. In all the other cases the testicle was preserved. Broca stated that he believed it always possible to preserve the testicle, and stated that he would not insist so much upon this point, were it not for the fact that he had recently seen in a book on anatomy reference to a large number of specimens of ectopic testicles obtained by castration.

[1] Gazette des Hôpitaux, March 1, 1899, p. 316.

From the statistics of Odiorne and Simmons, as well as the more recent ones of Rawling, it is evident that there is again need of recalling and emphasizing the opinions of Tuffier and Broca.

As regards Broca's results, 31 of the 79 cases, traced from one to six years, showed perfect results, the testicle having remained in the scrotum. In one case the testicle had retracted to the pubic region and became so painful that it had to be removed. In no case was there a relapse of the hernia, although in many cases the testicle had retracted upward in the direction of the external ring.

With reference to Broca's method of operation, it is briefly as follows: Ablation of the vaginal process of peritoneum; complete resection of the cremaster and fibrous bands about the cord; creation with the fingers of a new pouch in the bottom of the scrotum for the reception of the testicle; careful closure of the canal, as in the radical cure of hernia.

Except in two or three of the earlier cases, he never sutured the testicle in the bottom of the scrotum.

It will thus be seen that his method differed little from Tuffier's, except that he had given up the suture of the testicle in the scrotum.

This is practically the method that Dr. Bull, Dr. Walker, and myself have used for the last nineteen years at the Hospital for Ruptured and Crippled, though in addition we have made use of Bassini's free incision of the aponeurosis, which permits a higher dissection of the cord from the peritoneum. The results compare very favorably with our own.

Bassini's[1] report of 260 cases of inguinal hernia operated by his own method, which he describes therein, includes 17 cases in which he operated for the undescended testis.

The step of suturing the cord to the pillar of the external ring so strongly emphasized by Tuffier, seems to have been either forgotten or but little adopted by later surgeons, with the exception of Dr. Dowd, of New York, who used it and has spoken of its advantages at the New York Surgical Society. While up to the present time I have not personally tried it, I believe it is an excellent feature and intend using it in subsequent operations.

In Keen's *Surgery*, vol. iv, October, 1908, Arthur D. Bevan, of Chicago, gives a further elaboration of his method of operation for the undescended testis. The procedure was originally described in the *Journal of the American Medical Association*, September 23, 1899, and more fully in the same journal for September 19, 1903. The cuts in the latter paper make clear the different steps of the operation.

Bevan's operation was an undoubted and distinct advance over the methods in vogue at the time it was published, and it may be worth while again giving a description of the method, although this has already been done before in my chapter on Hernia in PROGRESSIVE MEDICINE

[1] Arch. f. klin. Chir., 1890.

for June, 1904. Bevan's own description of the procedure in 1899 is as follows:

"In operating on undescended testicle, whenever it is palpable about the canal, I have pursued the following technique: Incision, three inches long, over the canal; the incision should never involve the scrotum. It should never extend farther inward or downward than the external ring. If the testicle is in the canal, split the canal open the entire length by division of the external oblique, draw out the testicle by dividing all the covering over it down to the peritoneum, run the finger along the vas and carefully separate the peritoneum from the vas for two or three inches within the abdomen, run the finger along the spermatic vessels, and in the same way carefully free them from the peritoneum. Now separate the vaginal process from the cord high up, ligate the peritoneum of the internal ring, and divide the process one-half inch below the ligature; remove all the coverings from the cord, so that the testicle hangs suspended by the vas and the spermatic vessels. It is surprising how movable the testicle now becomes. It can be readily laid on the thigh several inches below Poupart's ligament. The index finger is now carried into close contact with the external oblique over the crest of the pubis into the scrotum, and with the blunt dissection of the finger a large pocket is made on that side of the scrotum for the reception of the testicle, great care being taken to make the opening of the pocket only as large as necessary to admit the testicle. The very freely movable testicle is now carefully slipped into the scrotal pocket, where it remains without tendency to retract. The testicle is not sutured to the scrotum, such suturing being of no value in preventing retraction, simply adding the risk of complications.

"If the testicle has been properly freed, it becomes at once evident that such suturing is superfluous, and if the testicle has not been freed sufficiently and cannot be retained in the scrotum without suture, then one may be sure that it will retract in spite of such suturing. The inguinal canal is now restored as in a Bassini operation for hernia, or what is probably better, a Bassini operation without transplanting the cord. After the closure of the canal and external ring, there still remains one of the most important steps of the operation, *i. e.*, the sewing of the deep layer of the superficial fascia to the aponeurosis of the external oblique by means of fine buried catgut. This is done throughout the operative field, over the inguinal canal, and well down over the pubic crest to the neck of the scrotum. The object of this step is to obliterate the areolar space between the superficial and deep fascia in front of the external ring. It is in this space that the testicle retracts in case of recurrence of the malposition."

At that time Bevan had operated upon three patients, one double and two single.

In the description of the method in his second paper (1903)[1] the step of suturing the superficial fascia to the aponeurosis is omitted. He adds a new step of dividing the spermatic vessels between two ligatures. This step, however, he reserves for the more difficult cases in which it is impossible to bring the testicle easily into the scrotum by other means. He states that reasoning from a clinical experience of more than 100 varicocele operations, in which he had removed all the structures of the cord, with the exception of the vas and its vessels, and had never seen gangrene of the testicle or any apparent interference with its nutrition, he concluded that the spermatic vessels could be safely sacrificed in those cases in which it appeared necessary. He further states: "Since adopting this seemingly radical yet perfectly safe method of sacrificing the spermatic vessels, I have had no difficulty in bringing the testis down into the scrotum, even in cases in which it was well in the abdominal cavity."

Inasmuch as a very large percentage of cases showed atrophy of the testicle, in some series as high as 20 per cent., in which the typical Halsted operation for inguinal hernia with ligation of the veins was performed, and, furthermore, considering the fact that cases are now on record in which this step of Bevan's was performed upon the undescended testis, resulting in gangrene of the testis, I do not believe that it is perfectly safe, and think it should be resorted to only in extreme cases.

It is unfortunate that Bevan does not give a detailed report of his cases showing the duration of observation and the position and size of the testicle at long periods after operation. In his latest publication on the subject, Keen's *Surgery*, vol. iv, October, 1908, he states that "of 34 operations performed, 30 have been completely successful. In two of the earlier cases, in which the testicle was not furnished with a tunica vaginalis, the organs became shrivelled up to a mass of connective tissue. In one case a hydrocele developed in the tunica vaginalis, which was later cured by carbolic acid injections." He states that in all the other cases organs of fair size or of normal size were found.

Statistics of any method of operation for the undescended testis have little value, unless the patients have been traced for a number of years after operation and the conditions as regards size and position of the testicle are carefully noted.

The *Annals of Surgery*, September, 1908, contains a paper of my own upon "The Treatment of the Undescended or Maldescended Testis Associated with Inguinal Hernia," which was read before the New York Surgical Society April 22, 1908, and based upon a study of 126 cases, upon which I personally operated from 1893 to 1908, with a tabulated list of the cases and their subsequent history.

As to the frequency of the undescended testis in inguinal hernia at

[1] Loc. cit.

the Hospital for Ruptured and Crippled between 1890 and 1908, we have observed 61,659 cases of inguinal hernia in the male, of which 783 were associated with undescended testis. At the time my paper was written I had personally operated upon 126 cases of various forms of undescended and maldescended testis. This number has since been increased to 147.

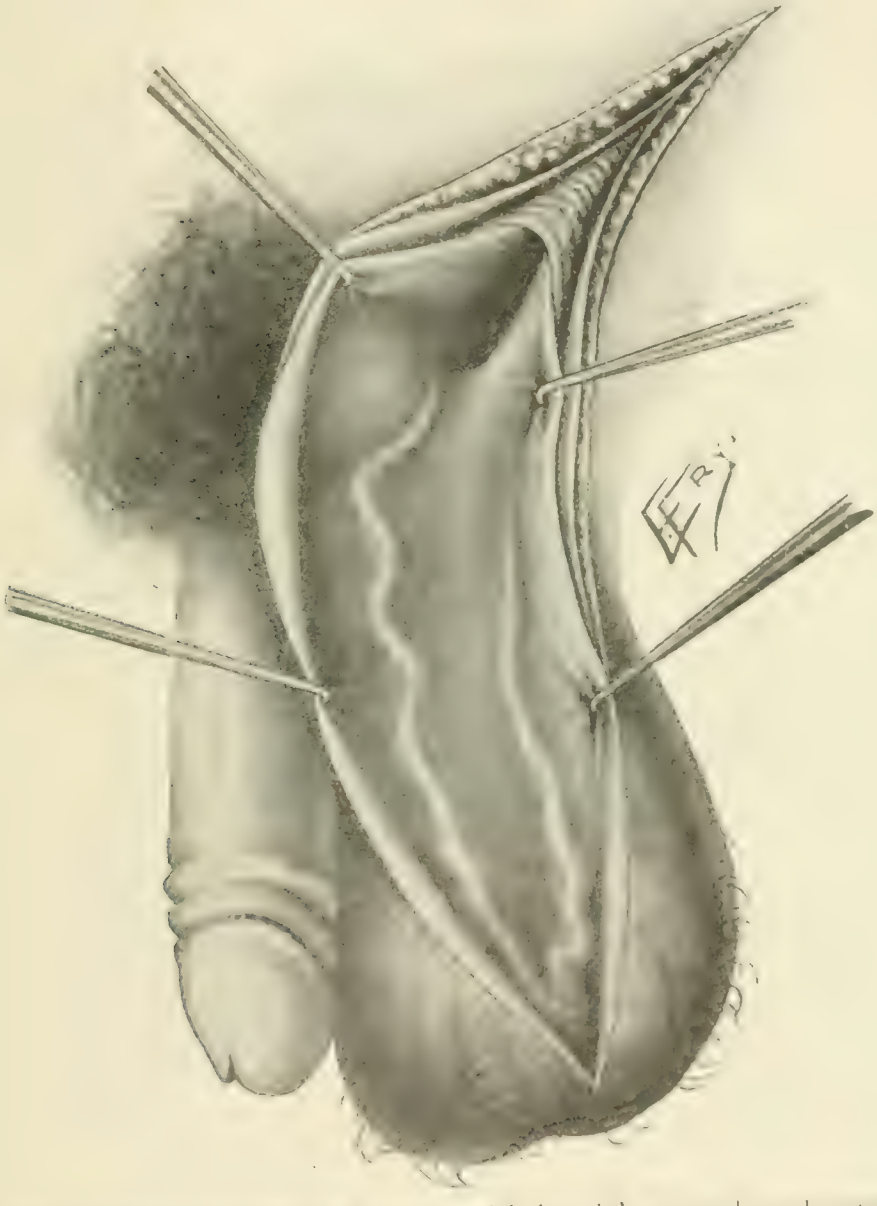

FIG. 1.—Rare type of undescended testis, with hernial sac and cord extending to bottom of scrotum. Testis arrested at external ring.

Inasmuch as few large statistics exist, except Broca's, in which the after results are stated, it is with special reference to this point that my own series may prove of interest.

I have frequently called attention to the rarity of published cases of perineal ectopia. The first case was described by Hunter in 1786. Curling, in 1857, was able to collect only 9 cases. Monod and Terrillon,

in 1889, found but 30 cases, and Klein, in his *Thèse de Paris*, in 1905–1906 after a careful search of the literature, increased the number of recorded cases to 81.

At the Hospital for Ruptured and Crippled during the past nineteen years only 17 cases of perineal ectopia have been observed, and in 11 cases which I have operated upon, the testicle was transplanted into the scrotum, except in one case, an adult, in whom the testicle was so completely atrophied that it was not considered worth saving.

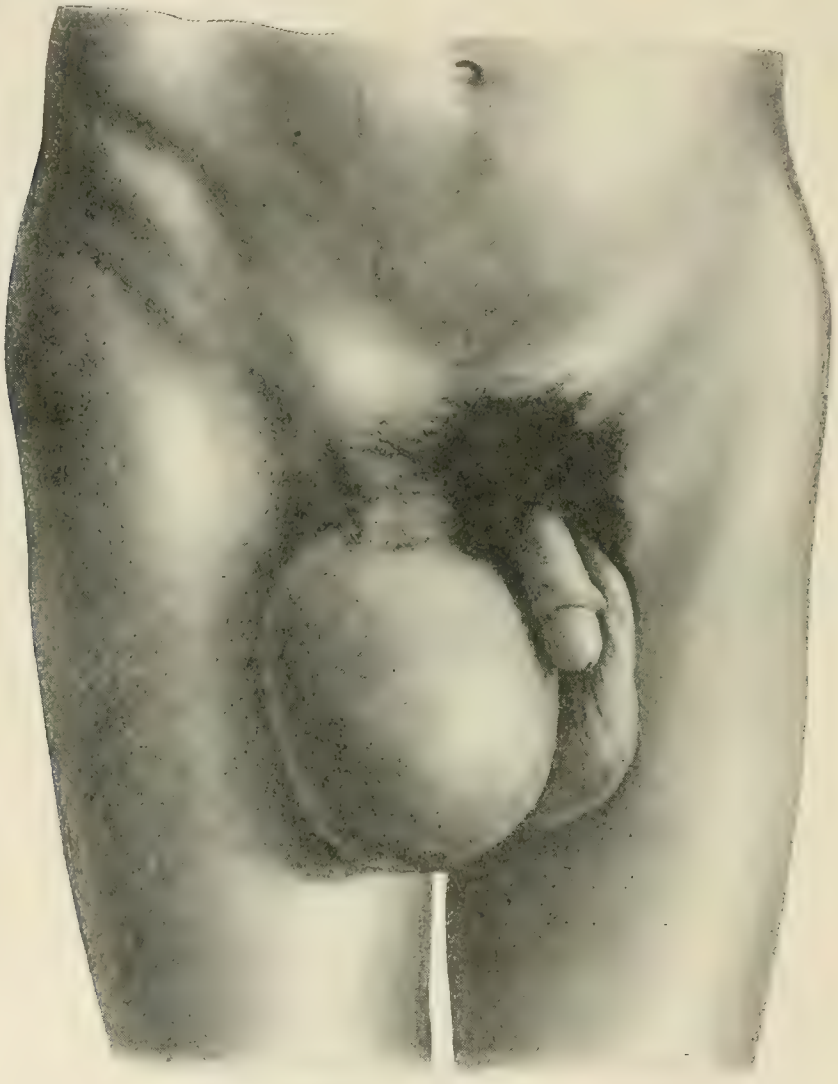

FIG. 2.—Inguinoperitoneal hernia from photograph.

With regard to the *etiology of the undescended or maldescended testis*, I referred briefly to the various authorities who are by no means agreed as to the exact cause of the condition. The majority, especially of the earlier writers, hold that the principal and almost only agent connected with the descent of the testis was the gubernaculum. Later, Sébileau believed that perineal ectopia "depends neither upon pathological nor anatomical causes and least of all upon the gubernaculum," but is really a purely congenital affair.

Championnière's opinion, based upon 44 operations in 39 patients,

strongly opposes the gubernacular origin of the undescended testis. He states that we do not know all the conditions which enter into the cause of the descent.

The latest writer upon the subject of the undescended testis, Büdinger, states that of 24 cases of inguinal retention of the testicle a mechanical

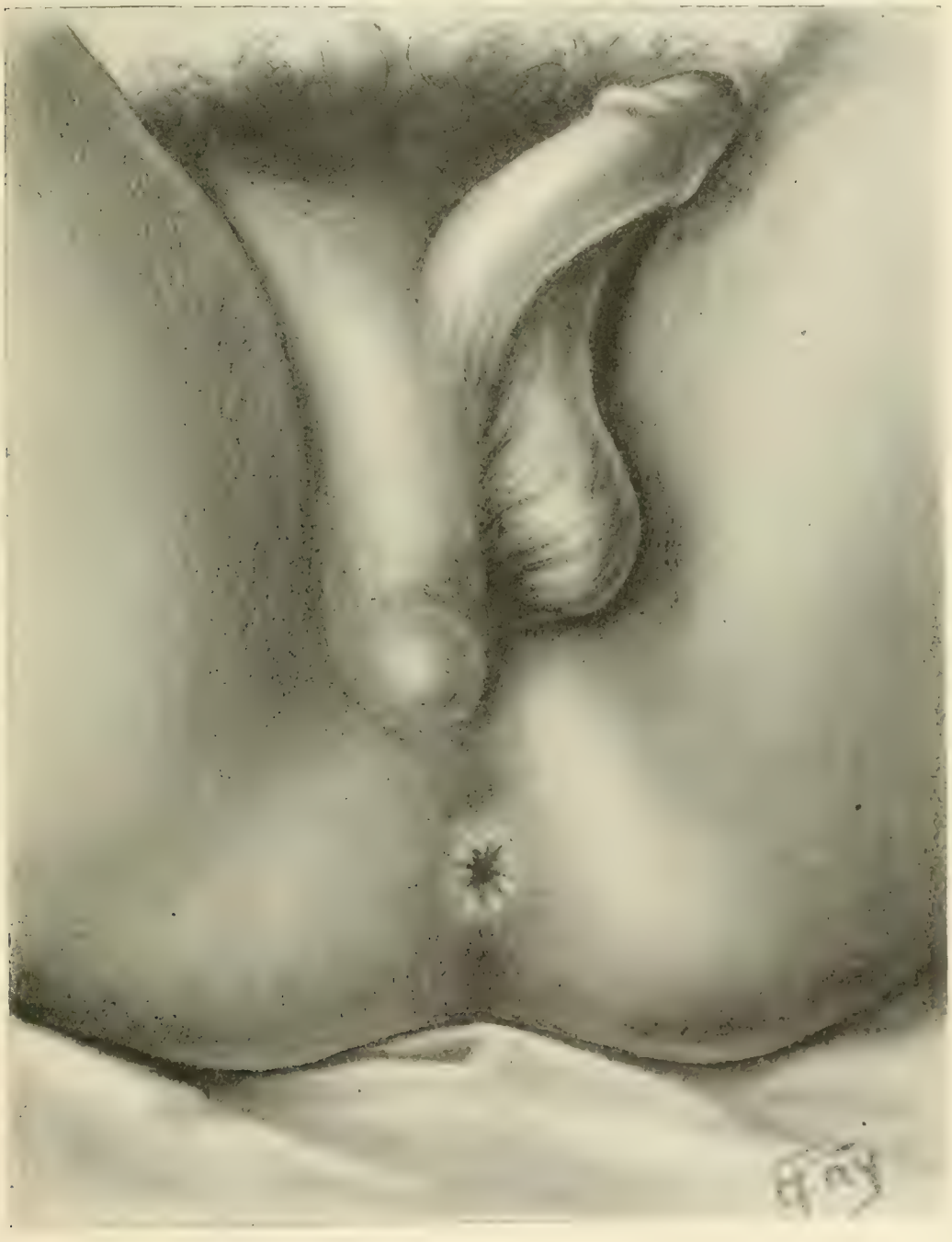

Fig. 3.—Inguinoperitoneal hernia.

obstruction of some sort was found to be the cause of the non-descent of the testicle in 15 cases. He further states that the cicatricial retractions of the peritoneum after inflammatory processes, that take place either before birth or in earliest infancy, in the neighborhood of the inguinal canal, are a frequent cause of the retention of the testicle.

Although most of the writers on the subject have advocated preserving the testicle wherever possible, it is surprising in what a large number of cases the testicle has been sacrificed. Championnière states that the ectopic testicle should always be preserved, for the reason that, although

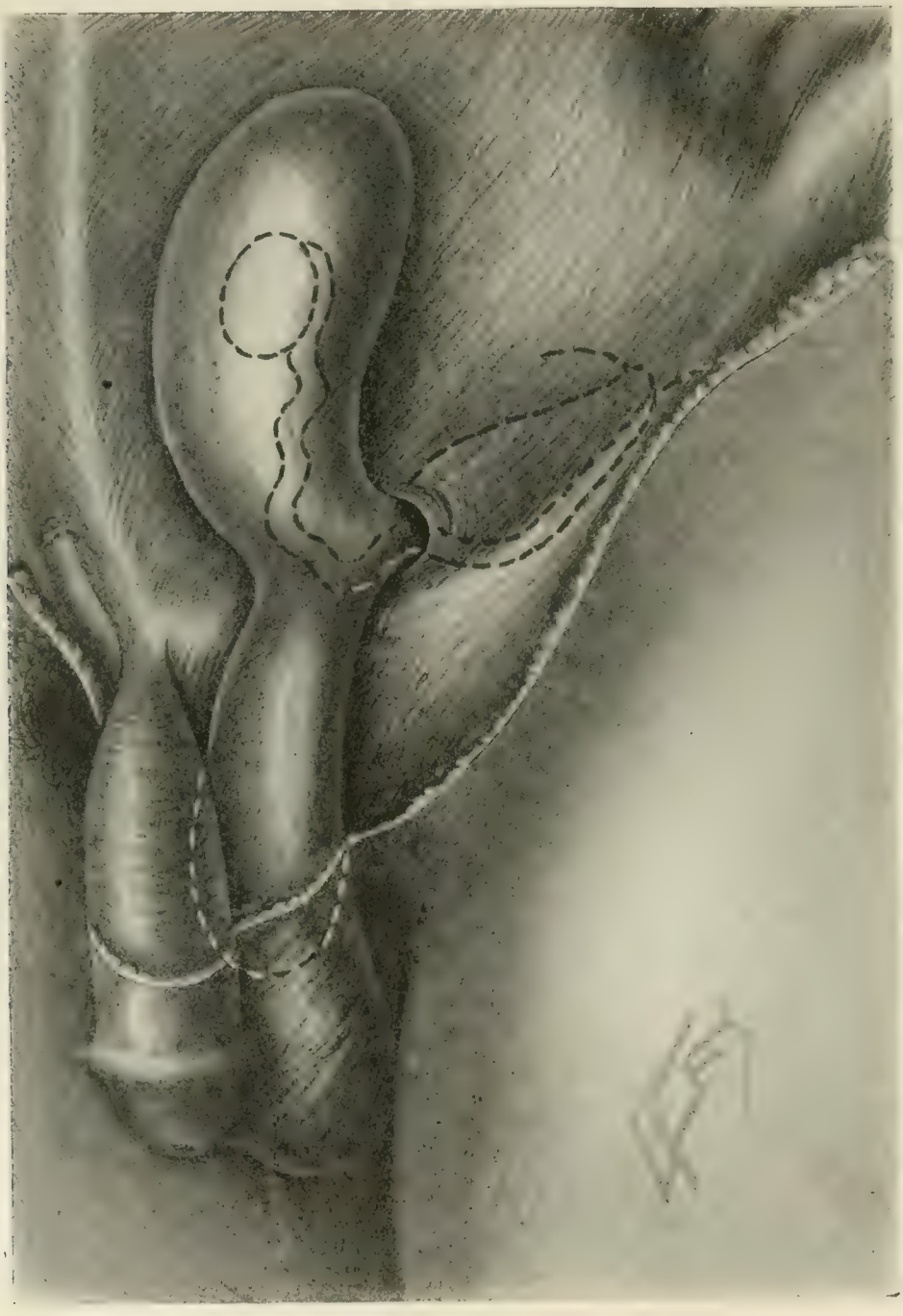

Fig. 4.—Inguinosuperficial hernia. Bilocular sac with testes in upper loculus.

it may have no functional value, it has an important influence upon the general health and virility of the subject. Yet his own series of cases shows that in 15 of 44 cases the testicle was sacrificed. In 50 cases out of the 120 at St. Thomas' Hospital, Rawling states the testis was removed.

Odiorne and Simmons[1] report 77 cases of undescended testis observed at the Massachusetts General Hospital from 1877 to 1904, in 28 of which the testicle was sacrificed.

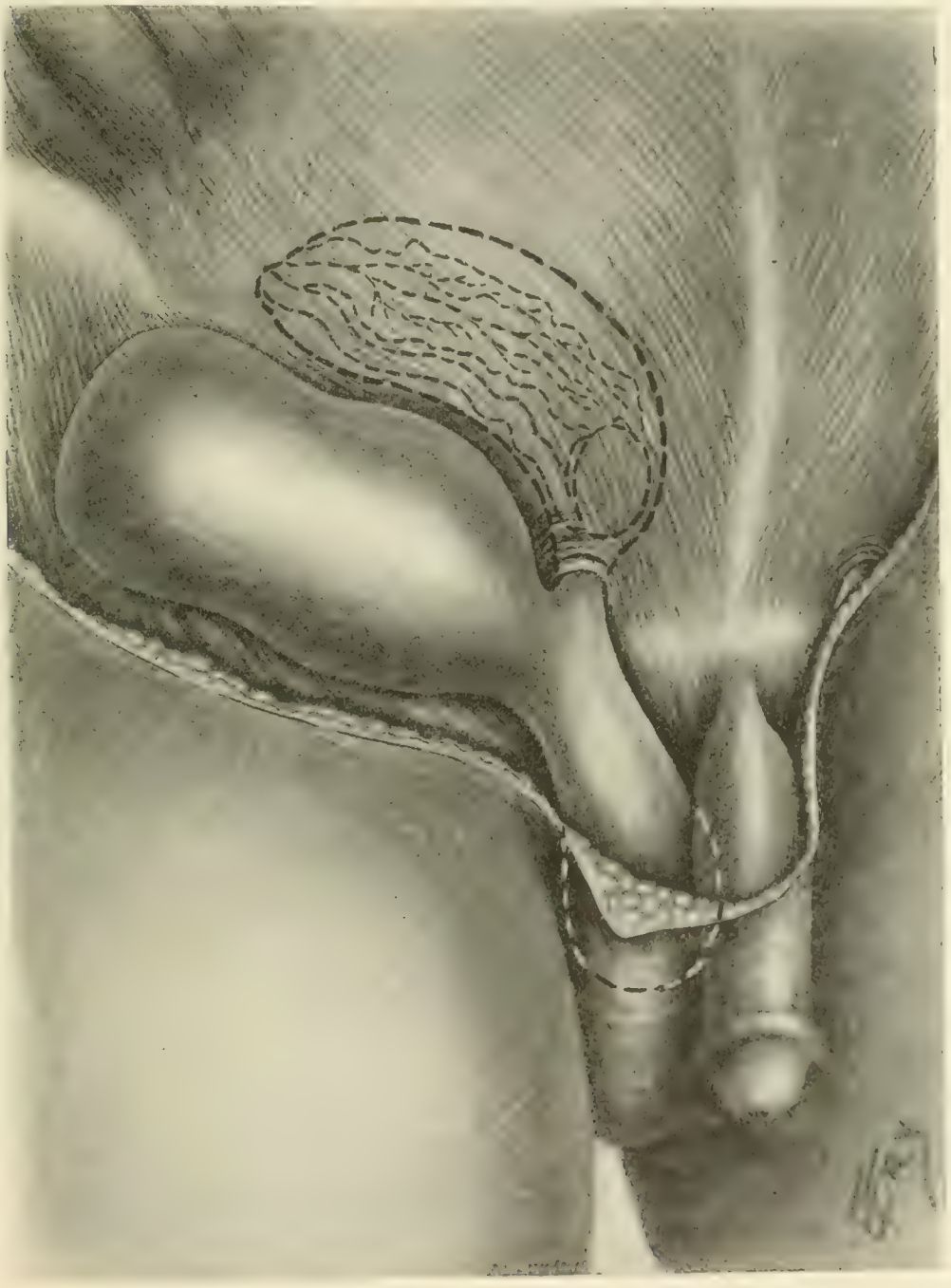

FIG. 5.—Inguinosuperficial and interstitial hernia with trilocular sac.

The subject of the treatment of the undescended testis was made the topic of the discussion at the meeting of the French Surgical Society in 1907. The discussion showed a very wide difference of opinion as to the best methods of operation and the indications for surgical treatment.

The question whether the undescended testicle is more liable to undergo

[1] Annals of Surgery, December, 1904.

sarcomatous degeneration than the normally descended testicle has not been definitely settled. The opinion that it is thus liable is a very old one, and has been handed down from one writer to another without being based upon any very accurate data. McAdam Eccles, whose experience rests upon 854 cases of undescended testis observed at the London Truss Society, believes that these testes are no more liable than ordinary ones to undergo malignant change. In not a single case in his series was a sarcoma observed. Furthermore, in 40 cases of sarcoma of the testis

Fig. 6.—Inguinosuperficial hernia. From photograph.

observed in one of the large London hospitals during a period of twenty years, there was only one case of sarcoma of the undescended testis.

On the other side, or in favor of the old opinion, must be placed the statement of Odiorne and Simmons, who report 54 cases of malignant disease of the testis observed at the Massachusetts General Hospital during a period of twenty-six years, with 6, or 11 per cent., occurring in the undescended testis.

However, sarcoma of the testis in any case is such a rare condition

that even if there should be a slight preponderance in favor of malignant disease attacking the undescended as compared to the normally descended testis, the increased chance of an individual with undescended testis contracting it must be regarded as too slight to carry much weight.

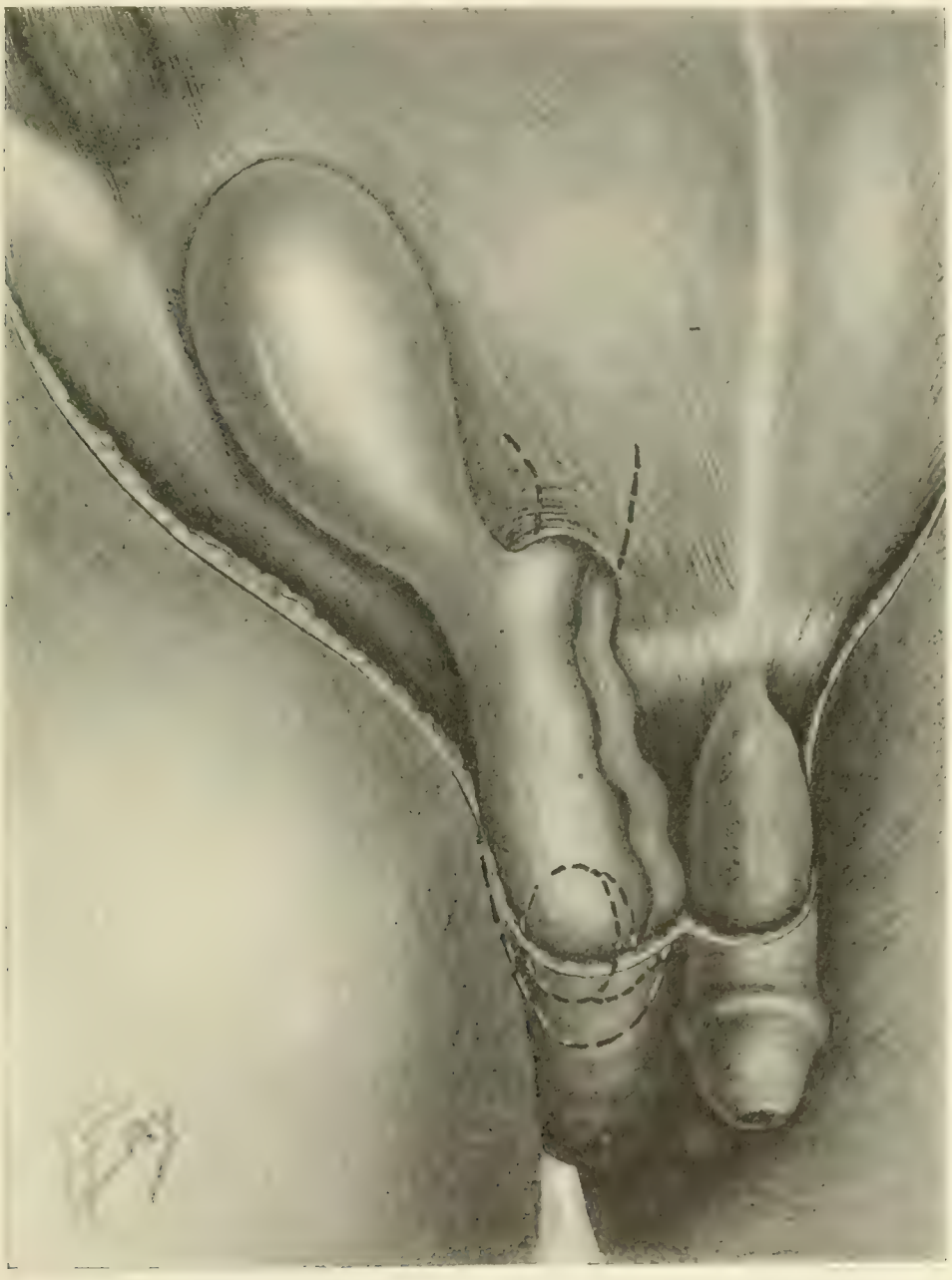

FIG. 7.—Inguinosuperficial hernia. Testis in upper scrotum.

I have personally observed 40 cases of sarcoma of the testicle. The first twenty-five all occurred in normally descended testes. Since then I have observed three cases in which the sarcoma developed in the undescended testicle.

My own statistics, with those of Odiorne and Simmons, would, therefore, point to a somewhat higher susceptibility to malignant disease on the part of the undescended testis than shown by McAdam Eccles.

On the other hand, at the Hospital for Ruptured and Crippled, in 783

cases of undescended testis observed since 1890, not a single case of malignant disease of the undescended testis has been observed.

As to the indication for operation on the undescended testis, and especially the age at which such operation should be advised, there is much difference of opinion. Some surgeons, especially among the

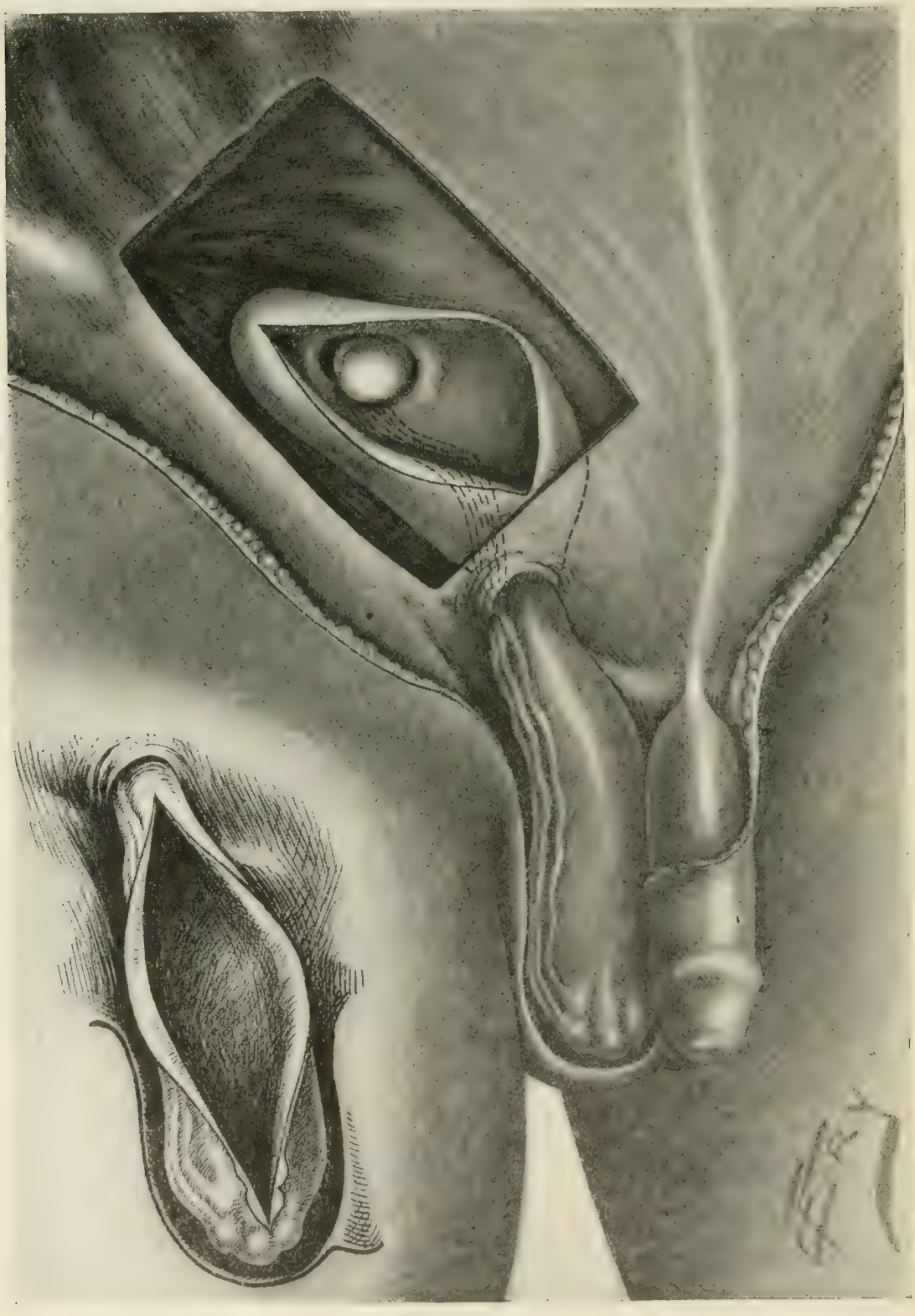

Fig. 8.—Case XII. Abdominal ectopia, with false cord extending to the bottom of the scrotum, where it ended.

French, advocate operation as early as two years; others wait until the age of puberty.

Bevan, in his earlier paper, was inclined to wait until after puberty, on the ground that some of these testicles descend without operation. In the later paper he changed his opinion and advocated operation, if possible, between the ages of six and twelve years. He there further stated that he did not believe that the undescended testicle descended spontaneously in many cases. I seldom operate upon patients under the age of eight years except in the presence of a hernia.

In just what proportion of cases the undescended testicle finally reaches the scrotum has, I think, never been determined. Since the publication of my paper I have made a careful analysis, with the help of Dr. H. M. Gillespie, of a very large number of children, several hundred with undescended testes associated with hernia (non-operated cases) observed at the Hospital for Ruptured and Crippled between five and fifteen years ago, in the hope of finding in just what percentage there was a spontaneous descent. The result of this investigation was not very satisfactory, on account of the very large number which could not be traced. It must be admitted, however, that in many cases the testicle does descend into the scrotum, especially in infancy and in the early years of childhood.

Of 739 cases of undescended testis observed at the Hospital for Ruptured and Crippled since 1890, 561 occurred in 18,410 children under the age of fourteen years, or 3 per cent.; while only 92 cases occurred in 3848 between the ages of fourteen and twenty-one years, or 2.2 per cent.; and only 75 cases in 37,370 over twenty-one years of age, or 0.2 per cent. That is, under the age of fourteen years undescended testis is fifteen times more frequent than after the age of twenty-one years.

Inasmuch as only comparatively few cases have been cured by operation during this period, the only conclusion is that the majority of undescended testes seen in infancy and early childhood eventually reach the scrotum through natural causes before the age of fourteen years. Still another reason for deferring operation is the fact that the results of operations performed between the ages of twelve and fourteen years are far better than those of an earlier age. One reason advanced in favor of early operation is that hernia associated with undescended testis is far more liable to strangulation. This assumption I believe to be incorrect and not supported by facts. We have never observed a case of strangulation of a hernia with undescended testis at the Hospital for Ruptured and Crippled.

The method of operation which I have employed in my own series of cases is as follows: Bassini's incision for inguinal hernia, freely opening the aponeurosis of the external oblique as high up as possible, surrounding the cord and hernial sac, which latter has always been found present, with one exception. Grasp the lower and posterior portion of the tunica vaginalis, or hernial sac, and by traction bring the testicle as far down

as possible. Next, separate the sac from the cord, high up, just outside the internal ring. In children this requires very careful and delicate dissection, as the cord is usually greatly enlarged and spreads out in a fan-like manner over an area of the sac one to two inches in width. If the dissection has been begun at the right layer, the sac can be isolated, and is then tied off as high as possible. In most cases of inguinal retention, and in many abdominal, the cord can then be freed sufficiently to permit the testicle to be brought at least into the upper portion of the scrotum, in most cases into the lower part, with the sacrifice of but few, if any, of the veins. Except in a very few of the early cases, I have never made any attempt to anchor the testis in the scrotum, but rely upon careful freeing of the cord high up and cutting away all fibrous bands. Suturing of the testicle within the scrotum is in my opinion of little value. If there is any tension, the scrotum is retracted up toward the external ring. The canal is then closed by the modified Bassini method, *i. e.*, the cord is brought out at the lower end of the wound, and the internal oblique is then sutured to Poupart's ligament over the cord. Great care is taken in placing the lowermost suture, which should include the reflected portion of the external oblique as well as the conjoined tendon and Poupart's ligament on the outer side. This suture, when tied, makes but a very small external ring, too small ever to permit the testis to retract into the canal, even should it reach the ring.

In my description of the method[1] I should have perhaps stated, although it then seemed unnecessary, that the lower end of the tunica vaginalis was treated precisely the same as in the ordinary type of congenital hernia, *i. e.*, it is sutured with catgut over the testicle, making a new tunica vaginalis. This has been done in every case by Drs. Bull, Walker, and myself since 1893. In my earlier cases I closed the canal by Bassini's method, but later (the first time in 1896) I used the modified Bassini method, not transplanting the cord, the advantages of which, as regards gain in the length of the cord, were pointed out by Bevan. The deep dissection with the finger in the iliac fossa, separating the vas and the spermatic vessels from the peritoneum "two to three inches within the abdomen," advocated by Bevan, I have not adopted, believing that such dissection might produce hemorrhage difficult to control. Bevan's purse-string suture of the scrotum at the external ring is, I believe, of distinct advantage.

As regards the rarer types of undescended or maldescended testes, in addition to 11 cases of inguinoperineal hernia, I have operated on 38 cases (13 adults and 25 children) of the inguinosuperficial variety, in which the testicle was found either in the superficial sac resting on the aponeurosis of the external oblique, or it could be made to enter this

[1] Annals of Surgery, September, 1908.

pouch on coughing. In two cases the testicle had evidently never occupied this sac. These cases I regard as of congenital origin.

Analysis of my Cases Reported in the Annals of Surgery, September, 1908. This series of cases comprises 128 operations. Of these, 25 represented an ectopia of the inguinosuperficial type, with the testis and sac resting upon the aponeurosis of the external oblique. There were 9 cases of the inguinoperineal type; the sac and testis occupied the perineal region.

There has been no recurrence of the hernia, and in only two cases was the testis sacrificed. In both the patients were adults, and in one a small atrophied testis was found in the bottom of the sac of a very large inguinoperineal hernia. The other case was one of abdominal ectopia, in which the testis could not be brought outside of the external ring.

Seventy-two cases have been traced from one to fifteen years, with the following results: 52 children were traced from one to fifteen years, 17 less than one year, 15 not traced; of 44 adults, 19 were traced one to ten years, 4 traced less than one year, 21 not traced.

Results in Adults. Of 19 adults examined from one to ten years after operation, the testis was found in good position in the scrotum in 8 cases, and at the external ring or not stated in the others.

One case deserves special mention, inasmuch as it shows the probable influence of the operation upon epilepsy:

The patient, aged twenty-five years, was operated upon five years ago for right undescended testis of the inguinal type. The testis was brought into the scrotum and has remained in good position ever since. At the time of the operation he stated that he had been subject since childhood to epileptiform seizures, the attacks occurring frequently, often within one to two weeks. In a letter received January, 1908, he states that he has never had a single attack since the time of the operation. The patient was presented before the New York Surgical Society at the time the paper was read.

Results in Children. Testis in scrotum in 11 patients, testis outside of external ring in 15 patients, and in canal or not felt in 4. As regards the cure of the accompanying hernia, the results have been perfect, not a single relapse having been observed.

Up to May 1, 1909, I have operated upon 147 cases of undescended testis, with no deaths and no complications, and while the results have not been ideal as regards the testis remaining in the bottom of the scrotum, they have been sufficiently good to cause me to dissent very strongly from Rawling's position that in most cases the testicle should be sacrificed.

Conclusions. From my own observations as well as from a careful study of the reports of other surgeons, I believe the following conclusions are justified:

1. The undescended testis is usually of little or no functional value.

If often gives rise to considerable pain, and is more subject to inflammatory attacks than the normally descended organ, and, possibly (though this is by no means proved), is more subject to malignant changes.

2. The undescended testis should never be sacrificed in children and very rarely in adults, it having been proved possible to effect a radical cure of the hernia quite as well without the removal of the organ. In childhood the testis, even if it never attains any functional value, is nevertheless of value in developing the male characteristics of the child as well as in promoting his general health. In the adult, it should be retained for its influence upon the mentality of the subject, if for no other reason.

3. Operation should seldom be performed under the age of eight to twelve years, unless the accompanying hernia demands such operative intervention, for the reason that in a considerable number of cases the testis descends spontaneously on the approach of puberty.

Abdominal ectopia unless double had best be left untreated, inasmuch as operation is difficult and by no means free from risk.

4. As to methods of operation, the main principles of any operation likely to yield satisfactory results must be: Free opening of the inguinal canal, which is secured by Bassini's incision; thorough freeing of the testis from any adhesions or peritoneal bands, even with the sacrifice of some of the veins, if necessary; bringing the testicle into the scrotum; suture of the canal without transplantation of the cord.

The present tendency in favor of giving up all forms of suturing the testis, either to the scrotum, the other testis, or the thigh, is, I believe, fully justified, though I believe it wise to adopt Tuffier's step of suturing the cord to the pillar of the external ring.

Inasmuch as very satisfactory results may be obtained without cutting away all the structures of the cord except the vas and its vessels, I believe this more radical step very seldom indicated.

5. No case of double undescended testis should be allowed to reach the age of puberty.

The wide difference of opinion as to the proper treatment of the undescended testis, and particularly the paper of Rawling urging a return to the pre-antiseptic method of castration, seem sufficient warrant for such a full discussion of the subject.

The Radical Cure of Hernia. Very little has been published during the last year upon the radical cure of hernia. The Bassini operation, or the modified Bassini, omitting the step of transplanting the cord, seems to have been gradually adopted by most of the surgeons here and abroad.

Our own records at the Hospital for Ruptured and Crippled show very little difference in results between cases in which the typical Bassini operation was performed and those in which the modified Bassini operation was done, in which the transplantation step was omitted.

From December, 1891, to January 1, 1909, 2384 operations have been

performed for the radical cure of hernia at the Hospital for Ruptured and Crippled by Drs. Bull, Walker, and myself.

Of these, 1773 were inguinal herniæ in the male; 445 inguinal herniæ in the female; 92 femoral herniæ; 41 umbilical; 24 ventral; 8 epigastric, and 1 lumbar hernia, with six deaths.

In 1284 the typical Bassini operation was done, with 9 relapses, 0.7 per cent.; in 481 the modified Bassini operation without transplantation of the cord (Bull and Coley method), with 3 relapses, 0.62 per cent.; or 1773 cases of inguinal hernia in the male, with 12 relapses, 0.68 per cent.

In all of the 445 operations for inguinal hernia in the female, the modified Bassini operation was done, *i. e.*, the round ligament was not transplanted. There were 3 relapses, 0.67 per cent.

In the 92 cases of femoral hernia in which the purse-string suture was used in pracitcally all cases there were no relapses.

In 135 cases in which an undescended testicle complicated the hernia there were no deaths and no relapses. It must be remembered that all of the cases of hernia in this series were children. The results prove, I think, that in children at least it is quite immaterial whether the cord is transplanted or not.

We cannot conclude, however, that the transplantation step is useless in adults. In 1150 cases of adults which I have personally operated upon outside of the Hospital for Ruptured and Crippled, the results in the cases in which the cord was transplanted have been superior to those in which this was not done.

I am at present of the opinion that it is better to retain the transplantation step in most cases of adults, especially if the hernia be large.

The cord should always be transplanted in direct hernia.

Accidents Occurring in Hernia Operations. Erdmann, of New York, in a recent paper in the *Annals of Surgery* (February, 1909), calls attention to certain accidents occurring in hernia operations.

The accidents to which he calls attention consist in injuries to the bladder, intestines, vas deferens, and vessels. With regard to the bladder injuries, he states that the question of injury in hernia operations has already been fully discussed by Roland Skeel in a paper read before the American Association of Obstetricians and Gynecologists, at Baltimore, September 24, 1908.

Skeel advocated the administration of methylene blue for several days before the operation in all cases where there was a suspicion of the bladder being in the hernial sac, so that the colored urine escaping from the injured bladder would be recognized as such.

He referred to a case of his own, in which injury to the bladder was caused by tying the ligature of the sac about a portion of the bladder, which was evidently drawn down by pulling on the neck of the hernial sac.

Erdmann states that two cases of injury of the bowel have been reported to him by members of the New York Surgical Society. In both these cases it was the sigmoid.

Injuries to the femoral vessels in inguinal hernia he believes due to the following causes: "(1) An anomalous distribution of the branches; (2) the needle; (3) the suture material as a contributing rather than as

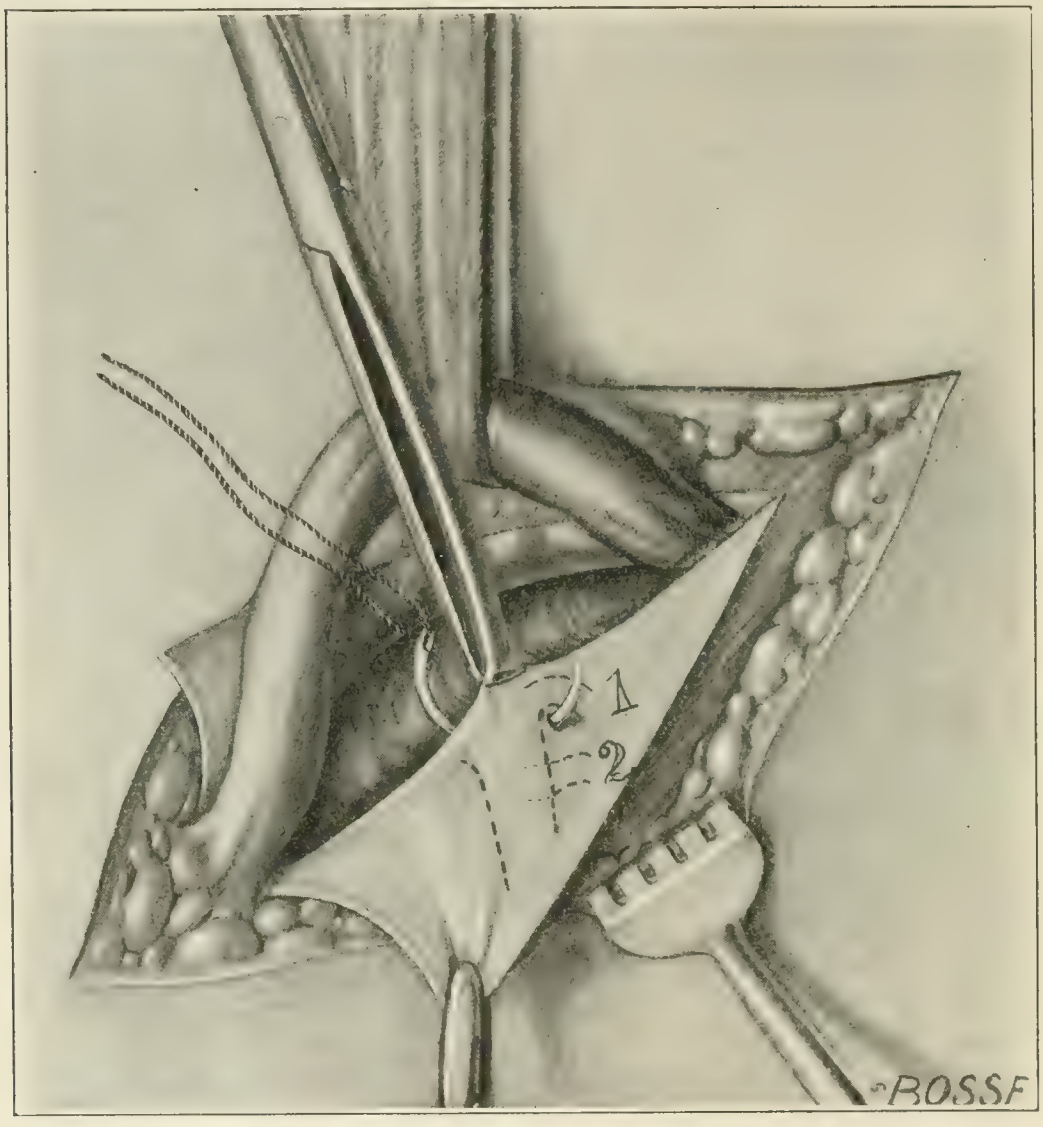

FIG. 9.—Shows forceps grasping the shelving border of Poupart's ligament, to retract the same as far as possible from the vessels; also shows the needle being passed from above downward, and passing about the high-placed superficial epigastric (1). Normal site of the superficial epigastric (2).

a primary cause; (4) the method of passing the needle from above or from below; and (5) exposure, etc., of the ligament. Injuries to the femoral vessels in femoral hernia so far reported to me by members of the Society were of the vein, explained very easily by the relationship of the vein to the saphenous opening. The branches of the femoral vessels likely to be involved in passing the needle would be any of the ones above the profunda, and they are, from above downward, the

superficial epigastric, the superficial circumflex iliac, and the superficial and deep external pudics. The involvement of any of the above branches except the superficial epigastric, would, in a normally placed set of branches, imply reckless suturing and suturing not of the kind as described by Bassini. Two cases of injuries to the deep epigastric, supposed at first to have been the femoral, are reported to me by two of the members of the Society.

Erdmann believes that the needle is responsible for injury in a considerable number of cases. The majority of the members of the Surgical Society stated they were using the Hagedorn needle, but Erdmann prefers a round needle with a sufficiently large eye to take the suture material.

"In passing the suture," Erdmann states, "one can follow down the artery with less danger of having the artery transfix itself upon the needle than by passing the suture from below upward. The suture material should be soft and pliable, not stiff and wiry." Careful exposure of Poupart's ligament and grasping the shelving border with a pair of forceps, he thinks, further lessens the danger of injury from the vein.

In response to his request for information, Erdmann received forty-two replies from members of the Surgical Society, showing 4 cases of injury to the iliac and femoral artery in operations for inguinal hernia. One member reported 3 cases of injury to the femoral vein; one an injury to the deep epigastric artery, with ligature; and one of injury to the deep epigastric vein, with ligature. Another member reported two cases of injury to the deep epigastric vein, with ligation. He has heard of two other cases of injury to the femoral vein.

In all these cases the injury was attributed to the needle.

Erdmann reports 2 cases of injury to the femoral vein and one—his own—to the femoral artery during operations for femoral hernia.

In commenting upon the subject I can do no better than to repeat what I said at the time of the discussion of Erdmann's paper:

From personal communications I know of four instances of injury to the arteries or veins from needle puncture during the insertion of the deep sutures in Poupart's ligament. The results in these cases were of interest. In one case the operation was done for strangulated hernia. The iliac vein was badly injured during operation, and the leg had to be amputated. In the second case the vein was opened; it was closed by lateral suture with uneventful recovery. In the third case the right iliac vein was injured during operation for inguinal hernia in a girl aged eighteen years. In this case the needle was introduced from above downward, and the surgeon stated that it required an extensive dissection in this region before the opening of the vein could be caught with forceps and a lateral ligature applied. The remaining steps of Bassini's operation were then completed, and a satisfactory recovery followed.

In the fourth case, the patient, aged sixty-four years, had been operated on for strangulated inguinal hernia on one side, and after that operation

was completed a further operation for a large, irreducible hernia on the other side was performed. The notes of the surgeon who did the operation stated that when passing the needle through the under surface of Poupart's ligament, he removed his finger from the tissues about the iliac artery too quickly, caught it with the needle, and when tied the thread cut through the atheromatous artery. When he removed the stitch a deluge of blood followed, showing that the external iliac artery had been wounded. It was compressed with the fingers until it could be secured by a clamp; then a ligature above and below was applied. The patient made a tedious recovery, with slight sloughing of the calf and heel. I believe that this accident can be always avoided if the following precautions are observed: The first and most important, I think, is that the needle should always be inserted in Poupart's ligament from below upward instead of from above downward (*i. e.*, it should be first introduced into the internal oblique muscle and then into Poupart's ligament, instead of vice versa). This is contrary to Dr. Erdman's opinion.

2. The ligament should always be pulled slightly upward and inward by a thumb forceps during the introduction of the sutures.

3. If the needle is held with the fingers instead of a rigid needle holder, the danger of injuring the vessels is still further lessened.

I have personally operated upon upward of 2350 cases of inguinal and femoral hernia, 1150 adults and 1200 children, without ever having met with an accident of any kind. The illustration of Erdman shows a much larger "bight" on the edge of Poupart's ligament than is necessary or safe.

At the Hospital for Ruptured and Crippled 2340 operations have been performed by Drs. Bull, Walker, and myself, without accidents, due, largely, I think, to the observation of the precautions above stated.

With regard to injury in hernia of the bladder, in practically every hernia of the badder that I have seen there was present a large amount of extraperitoneal fat. In the presence of this fatty tissue outside of the sac I am always suspicious of a bladder hernia, and take special precautions not to tie off the sac too high up. Thus far I have never injured the bladder.

Tumors of the Hernial Sac. One of the most common varieties of tumors of the hernial sac is the cyst or so-called hydrocele of the canal of Nuck. This condition was formerly regarded as exceedingly rare, but in recent years more accurate diagnosis shows that it is by no means uncommon. Wechselmann, in 1890, collected 62 cases, and at the Hospital for Ruptured and Crippled we have had 140 cases. In 1892 I reported 15 cases personally observed.[1]

Solid tumors of the inguinal canal are exceedingly rare. C. O. Kepler[2] reports a case of dermoid cyst of the canal of Nuck, and gives

[1] Annals of Surgery, 1892.

[2] Boston Medical and Surgical Journal, August 20, 1908.

a very careful review of the literature. His case is of very great interest and deserves a brief abstract:

Miss E. R., aged twenty-six years, with negative family history, had worn a truss from childhood for a supposed right inguinal hernia. The hernia became apparently cured, but re-appeared two years prior to the date of the operation. The symptoms were strongly suggestive of catarrhal appendicitis, with irregular recurrences every two to three months. At the same time there appeared a sausage-shaped, painless swelling in the right inguinal canal. This became gradually more and more prominent, occasionally disappearing for short intervals. Since about a year it had been irreducible. The pain was aggravated by muscular exercise. Physical examination at the time of the operation showed the abdomen negative, except a muscular spasm and moderate tenderness over McBurney's point. In the right upper portion of the mons veneris was a smooth, sausage-shaped mass, somewhat elastic, which seemed capable of being pushed moderately into the inguinal canal and then reappearing. It was only slightly sensitive on pressure.

The diagnosis of chronic catarrhal appendicitis, associated with inguinal hernia, was made and operation performed in April, 1907. The uterus and appendix were normal. The right ovary was normal in character, and not adherent. A typical catarrhal appendicitis was found and treated in the usual way. Incision over the tumor in the inguinal canal showed a mass somewhat harder than would be expected of a hernia and sharply circumscribed. The mass occupied the canal of Nuck and could be displaced upward about two inches. The mass was carefully removed and the wound closed by Bassini's method. On opening the tumor there was an escape of much thick, white cheesy material and hair. The pathological examination was made by Dr. Leary, of Tuft Medical School, who reported as follows:

"The specimen represents a small cyst from the canal of Nuck free of most of its contents. The sac was 8 x 6 cm. The wall was pale and membranous. The remaining contents consist of a grayish white substance composed of sebaceous material and desquamated cells in which a number of blackish hairs were embedded. Microscopically, the cyst wall is lined with stratified squamous epithelium set upon a dense connective tissue in which are embedded sebaceous glands and hair follicles. The greater part of the wall is made up of connective tissue, abundant bloodvessels, and fat tissue. Contents consist of desquamated cells and sebum. Diagnosis: Dermoid cyst."

Kepler states that a careful review of the literature fails to reveal a single case of dermoid cyst of the canal of Nuck. Patterson,[1] in 1903, reports a dermoid cyst in the inguinal canal in a man aged thirty-five years, of five years' duration. In this case the tumor was five inches

[1] Transactions of the Pathological Society of London, 1903, p. 147.

long, elastic and oval, occupying the inguinal canal, but not communicating with the abdominal cavity. Its contents consisted of a thick, pultaceous material and a single hair. The wall of the cyst was examined by a committee of the members of the council of the London Pathological Society, who, after careful examination, stated: "We consider that this cyst may be classified as a dermoid."

The Reduction en Masse of Strangulated and Non-strangulated Hernia. Corner and Howitt[1] publish a very valuable paper on this subject.

This paper contains 6 new cases, as well as a brief *resume* of the accumulated experience of others.

While they admit that reduction *en masse* in its extreme form is rare, they state that in the lesser degree these cases are of such common occurrence that every surgeon will see at least half a dozen such cases in the course of a year.

In the past the condition has rarely been referred to except in cases of strangulated hernia.

As regards its frequency, they state that during the years 1894 to 1906 883 cases of strangulated hernia were admitted to St. Thomas' Hospital, during which time 3 cases of reduction *en masse* were observed, or a proportion of 1 in 294 cases. At St. Bartholomew's Hospital, from 1890 to 1905, there were admitted 735 cases of strangulated hernia, with 2 reductions *en masse*, or 1 in 368. Combining these two, we have a proportion of 1 in 331 cases. The writers have collected 137 examples of reduction of strangulated hernia *en masse*—110 males, 18 females; 68 occurred on the right side, 39 on the left; 113 were inguinal, 22 femoral, and 2 obturator hernia.

As regards results of operation, 59, or 52 per cent., of the inguinal cases recovered; of the femoral, 6, or 28 per cent., recovered; in the obturator herniæ (2 cases) the mortality was 100 per cent.

The reduction *en masse* was performed in 50 per cent. by medical men and in 28 per cent. by the patient; 4 per cent. occurred spontaneously, showing that injudicious taxis by the physician is the most frequent cause.

As to the duration of the hernia previous to its reduction *en masse*, definite data were obtained in 100 cases. It occurred within twenty-four hours of its appearance in 8 per cent.; one year in 2 per cent.; one to two years in 2 per cent.; ten to fifteen years in 15 per cent.; over thirty years in 18 per cent.

The average age at which reduction *en masse* occurred was forty-seven years, the youngest being thirteen, the oldest seventy-nine years of age.

In the acute cases the viscus most often found was the small bowel.

Corner and Howitt state that while hitherto it has been the custom

[1] Annals of Surgery, vol. xlvii, p. 573.

to recognize only acute cases of reduction *en masse*, they believe that cases of subacute or chronic reduction *en masse* are plainly recognizable, especially if the contents of the hernia are portions of the large intestine. In this connection they mention sliding hernia, or hernia par glissement, omental hernia, and bladder hernia.

With regard to the diagnosis, the writers state that the danger of reduction *en masse* lies in the fact that it is not recognized and that it requires a further operation. They warn against injudicious taxis on the part of surgeon or physician, as this is most frequently responsible for the occurrence of reduction *en masse*. They state that spontaneous reduction *en masse* is most apt to occur in strangulated femoral, small and recent inguinal, and obturator hernia. They point out the possibility of reduction *en masse* occurring even at the operation for strangulated hernia, and refer to the practical difficulty of doing a herniotomy or kelotomy in some cases, *e. g.*, small partial enteroceles. The authors sum up the diagnosis of reduction *en masse* as follows: "The continuance of the signs and symptoms of intestinal obstruction after the apparent reduction of the hernia by taxis or operation." "The treatment," they add, "is easier to decide than the diagnosis." If the signs and symptoms of obstruction persist after the reduction of a hernia, the abdomen should be opened and the reason of the obstruction ascertained and treated. This should be done with as little delay as is necessary to make the diagnosis of the persistence of the symptoms.

But all cases are not so easy as the above might lead one to imagine. The reduction *en masse* of a partial enterocele, most likely from a femoral or obturator hernia, may be followed by some relief of the symptoms, the bowels acting and the vomiting ceasing. But in spite of this temporary relief there is no real and lasting improvement. It is sufficient, however, to delay the diagnosis of "unrelieved obstruction" until the ensnared bowel is necrosed or beyond recovery, and perhaps the patient may have become too ill to bear an operation which may have to be a long one.

An important physical sign in some cases is that the upper part of the inguinal canal on the side of the hernia is indefinitely full and not empty.

With regard to treatment, they advise operation by means of an incision in the median line below the umbilicus when the exact diagnosis is uncertain, or, if the diagnosis has been definitely made, over the region where the hernia was reduced *en masse*, and especially so if the inguinal canal feels "full." They term these incisions general and local, respectively, and add that a local incision is often adequate for an inguinal hernia, but not for a femoral hernia, in which the general incision is to be preferred.

Pseudo-incarceration of Herniæ. An exhaustive paper on this subject has been published by Clairmont.[1] By this designation he means to

[1] Arch. f. klin. Chir., Band lxxxviii, Heft 3.

convey that the relation of the hernia to the clinical picture in these cases is but a secondary or subordinate one. He gives a rather full report of ten cases observed at v. Eiselsberg's clinic, which show that herniæ may undergo changes as a result of various affections that cause

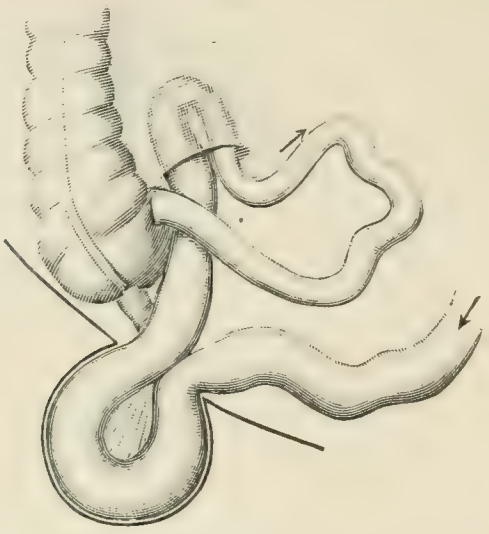

Fig. 10.

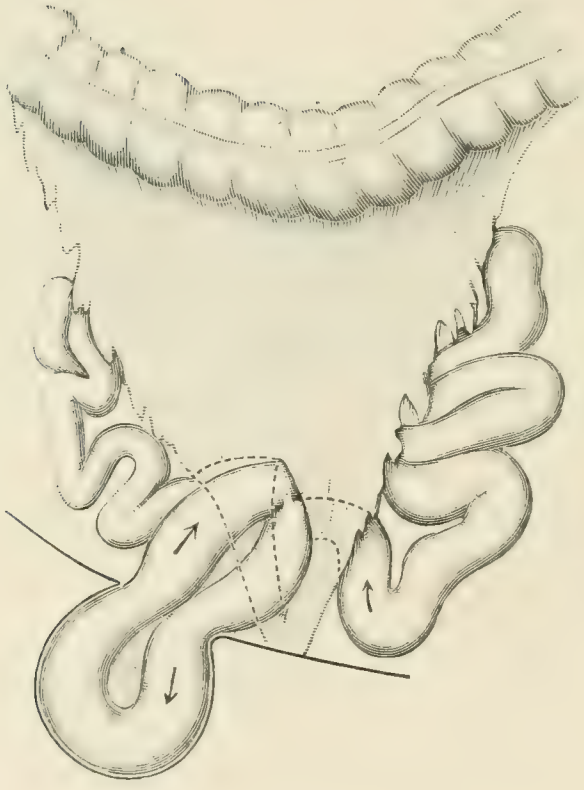

Fig. 11.

intestinal occlusion, either by strangulation, volvulus, or by paralysis of the intestinal muscular structure due to peritoneal inflammation. Herniæ hitherto free suddenly become irreducible and more or less painful and tender. In the presence of nausea, vomiting, swelling of

the abdomen, and visible peristalsis, such herniæ may be regarded and treated as incarcerated. If taxis proves successful, the patient may be considered cured. However, the symptoms continuing, another cause for the intestinal obstruction will have to be found. If taxis be unsuccessful, herniotomy is resorted to, but the loop of intestine will not show the anatomical signs of incarceration, and a following laparotomy will have to clear up the diagnosis.

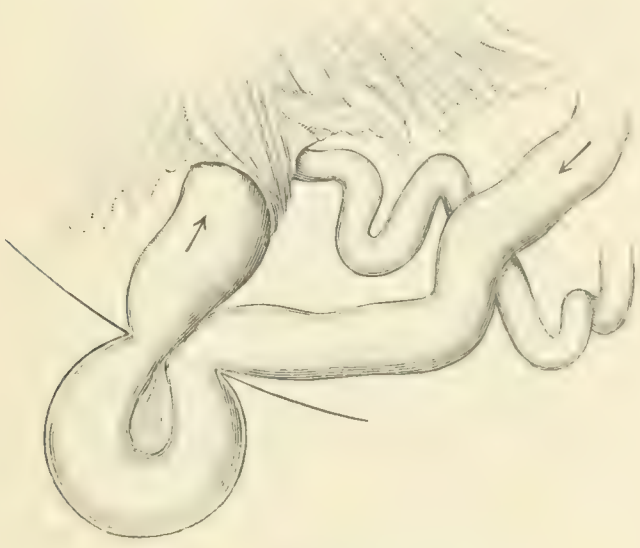

FIG. 12.

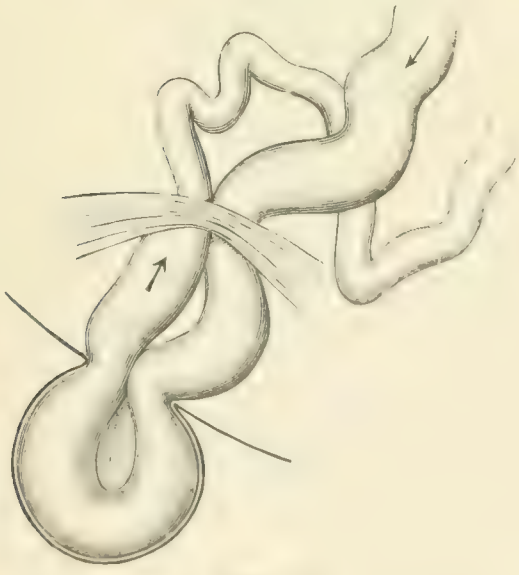

FIG. 13.

Or, the hernia, clinically, shows the complete picture of incarceration, which renders useless any attempt at taxis, and the condition is confirmed by herniotomy. Unusual conditions of the loops of intestine may arouse the suspicion of a *second* obstruction, intra-abdominally, which may lead to laparotomy.

Of the 10 cases reported, 7 died, giving a mortality of 70 per cent.

The material collected by Clairmont shows that a mechanical ileus may be due to:

1. Incarceration of a second external hernia.
2. Incarceration of an internal hernia (Fig. 10).
3. Incarceration in an abnormal interstice (Fig. 11).

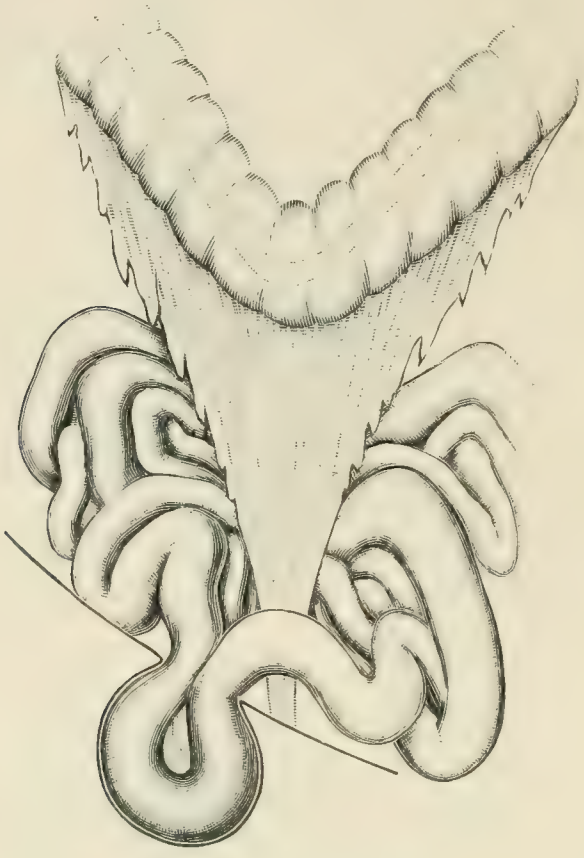

Fig. 14.

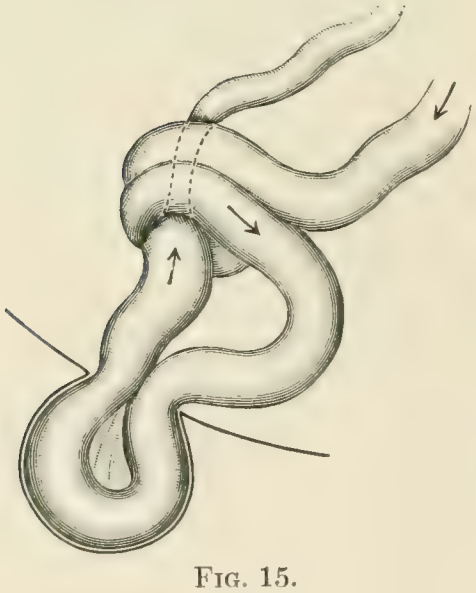

Fig. 15.

4. Strangulation, that is:
   (*a*) Of the efferent loop (Fig. 12).
   (*b*) Of the hernial loop of intestine (Fig. 13).

(*c*) Of the entire convolution of small intestine to which the hernial loop belongs (Fig. 14).

(*d*) Of a loop of intestine whose relation to the hernia is not known.

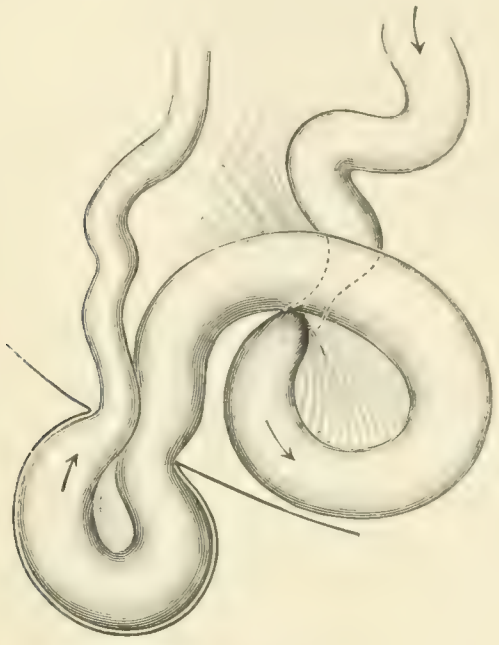

Fig. 16.

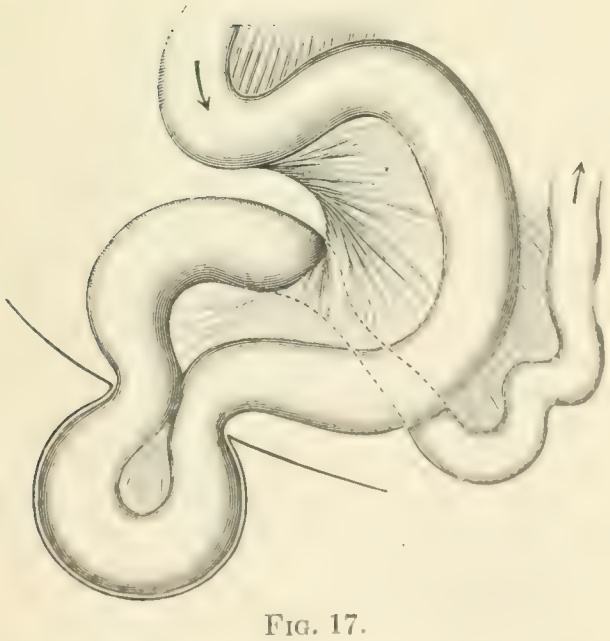

Fig. 17.

5. Compression of a loop of intestine by kinking or twisting around a cord formed either by the omentum, the intestinal loop in the hernial sac, or its mesentery; that is:

(*a*) Of the afferent loop (Fig. 15).

(*b*) Of the efferent loop.

(*c*) Of an intestinal loop whose local relation to the hernia is not shown.

6. Volvulus; that is:
   (*a*) Of the afferent loop (Fig. 16).
   (*b*) Of the efferent loop.
   (*c*) Of the hernial loop of intestine with torsion above or below the hernial opening (Figs. 17 and 18).

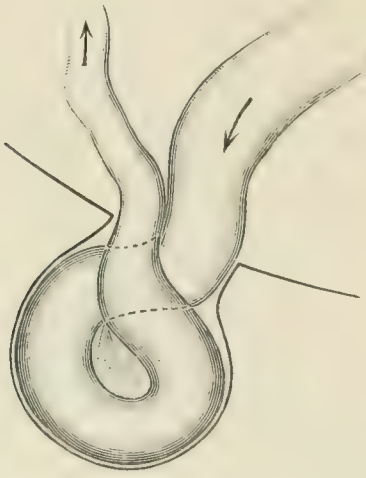

Fig. 18.

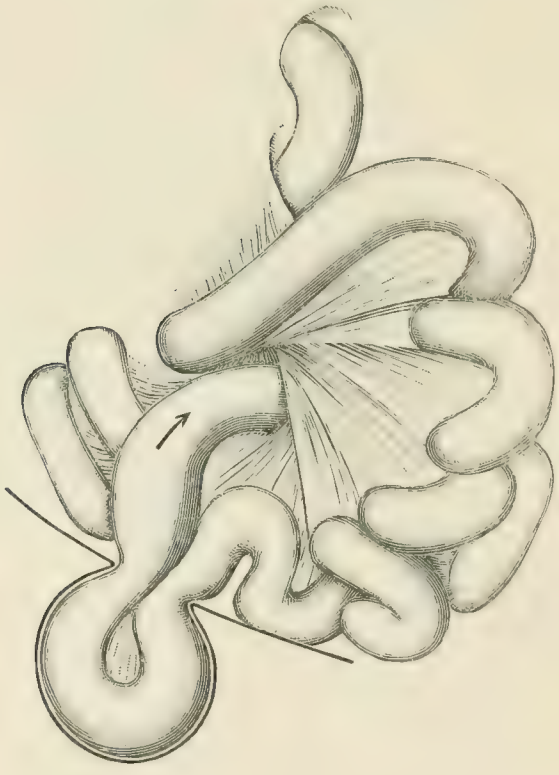

Fig. 19.

   (*d*) Of a larger section of gut, of which a part lies in the hernial sac (Fig. 19).
   (*e*) Of a loop of intestine whose position to the hernial loop of intestine remains obscure.
7. Invagination.
8. Obturation by a foreign body.

9. Benign stenosis.
10. Malignant tumor (Fig. 20).

The *dynamic ileus* may be due to the following causes:

1. Aseptic peritonitis.
2. Septic peritonitis.
3. Appendicitis.
4. Acute hemorrhagic pancreatitis.

With regard to the diagnosis, Clairmont states that: In the early stage, pseudo-incarceration of a hernia may be recognized mainly by the moderate degree of tension and painlessness of the hernia. While the disease underlying the pseudo-incarceration, or existing in conjunction with a true incarceration, may be recognized as a mechanical or paralytic ileus, the exact diagnosis can be made in exceptional cases only.

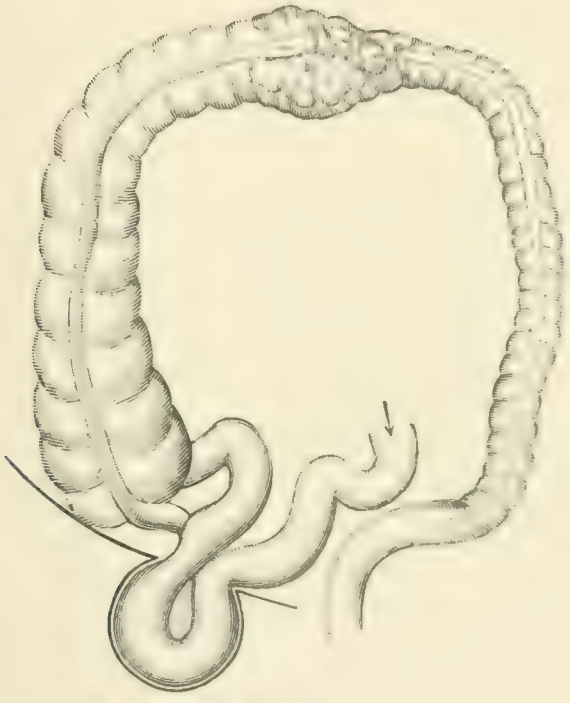

FIG. 20.

The prognosis of these cases is unfavorable.

Naunyn has said that the prognosis of intestinal obstruction is far more favorable if associated with hernia. He ascribes this to the fact that the cause of the intestinal obstruction is usually in some way related to the hernia, and that therewith an important clue as to the location of the obstruction is furnished.

Duchaussoy collected 39 cases, in 28 of which the occlusion was found on the side of the hernia and very near to the hernial ring through which the hernia protruded. In seven cases the occlusion existed on the same side, though somewhat farther removed from the hernia. Three patients had a double hernia, and here, too, the obstruction was found

in the neighborhood of the hernia. In one case the occlusion lay on the side opposite to the hernia.

Prutz, on the other hand, emphasized the sad experience he had with ileus complicated with hernia.

These contradictory statements may be explained by the fact that Naunyn has excluded all such cases in which the outer hernia was incarcerated; while in nearly all previously reported cases the hernia was regarded as incarcerated, even though in the majority of cases only consecutive changes of the hernia had taken place. Thus, Clairmont states, Naunyn has excluded the most serious and dangerous cases.

According to Clairmont, the cases operated upon since 1880 show a mortality of 70 per cent., *i. e.*, 35 out of 50 patients died as a direct result of the operation.

Wilms (1906) gives the mortality of operation for intestinal obstruction as 43.7 per cent.; Sultan (1901) reports a mortality of 20.7 per cent. after herniotomies.

Clairmont states that improvement in the results can be expected only if pseudo-incarceration is recognized earlier, best before any attempts at reduction have been made, or before herniotomy, but latest during operation. If herniotomy has to be followed by a second operation, owing to a continuance of the symptoms of ileus, it is usually too late.

Bladder Hernia. Eggenberger[1] has complemented the statistics of bladder hernia compiled by Brunner in 1896, consisting of 182 cases, by adding 110 cases, 5 of which were observed at the Basel clinic. While Brunner collected the majority of his cases from the French literature, Eggenberger's 110 cases show 41 taken from the German, 20 from the Italian, 17 from the French, 9 each from the English and Swedish, and 7 each from the Russian and American literature.

Eggenberger states that the great majority of bladder herniæ are in fact false herniæ, as they either have no peritoneal sac at all, or the bladder is found alongside of the hernial sac instead of within the same.

According to the manner in which the peritoneum is involved in these bladder herniæ, Eggenberger differentiates four varieties, namely, extraperitoneal, paraperitoneal, with double hernial opening, paraperitoneal with a single opening, and intraperitoneal or true bladder hernia.

Eggenberger's statistics show 25 cases of extraperitoneal bladder hernia; however, only in 15 was the absence of a peritoneal protrusion especially mentioned, so there may be some doubt as to the remaining 10.

Of 61 cases of inguinal bladder hernia collected by Eggenberger, 10 were of the paraperitoneal variety with double hernial opening. Brunner found 12 such in 132 cases.

Of paraperitoneal bladder hernia with a single hernial opening, repre-

[1] Deutsche Zeitschr. f. Chir., October, 1908.

senting by far the most common variety of bladder hernia, Eggenberger reports 73 cases, *i. e.*, 43 external, 8 internal inguinal, 21 femoral, and 1 perineal.

Of the intraperitoneal or true bladder herniæ, Eggenberger was able to find but 1 case reported during the last ten years. Brunner's statistics show 5 cases.

All bladder herniæ were found to have their exit through the known hernial openings in the peritoneal region.

The external inguinal herniæ are by far the most frequent—53 per cent.; next come femoral, with 27 per cent.; direct inguinal, 17 per cent.; of bladder herniæ of the linea alba, only 2 were observed within the last ten years; perineal bladder hernia, 1 case; of bladder hernia of the foramen obturatum and of the foramen ischiadicum not a single case has been reported within the last fifty years.

The contents of the accompanying peritoneal sac in paraperitoneal bladder hernia usually consists of the small intestine; occasionally an ovary with tube, the cecum or transverse colon is found. The bladder portion of the hernial contents does not, as a rule, attain to larger size than that of a cherry or walnut. Relatively frequent are *ureteral herniæ*. Eggenberger found 7 such cases; in one of them both ureters had come down with the bladder. The prolapsed loop of ureter was invariably found in the posterior part of the peritoneal sac, below the peritoneum, having the shape of a handle whose two shanks disappeared within the abdominal cavity. Carli, in his work upon ureteral hernia, mentions 4 cases combined with bladder hernia and 7 of simple ureteral hernia, all belonging to the paraperitoneal variety of hernia.

As regards the presence of a prevesical lipoma in bladder hernia, this has often been referred to by French authors. Monod and Delagénière, as well as Lotheissen, consider it a constant phenomenon in bladder hernia. In 50 per cent. of the cases reported by Eggenberger an unusually large amount of fat, or a lipoma, is especially mentioned. In a very few cases only is the absence of this accumulation of fat emphasized.

With regard to the relative frequency of bladder hernia, judgments seem to differ considerably. Brunner found, in a collection of 1841 operations for various forms of hernia, 16 which were complicated with cystocele, or about 1 per cent. Eggenberger's statistics show 75 cystoceles in 6778 hernia operations, 1.1 per cent. Lucas Championnière reported 6 in 900 operations; Carle, 13 in 1400 operations. Eggenberger states that only one-tenth of all bladder herniæ are discovered before operation. He believes that many deaths after herniotomy, when no autopsy is made, may be attributed to an injury to the bladder. With Bassini's method, cystoceles are much more likely to be discovered than with Kocher's operation, as shown by Lotheissen.

True congenital bladder hernia, Eggenberger states, do not occur.

No anatomical difference has been observed between bladder herniæ noticed soon after birth and those that appeared later. Hence, he states, there is no reason to differentiate congenital and acquired cystoceles. A congenital predisposition to hernia must be drawn into consideration. He believes it is lack of tone of the bladder wall and musculature rather than any abnormal configuration of the bladder that furnishes the predisposition to hernia.

Previous affections of the bladder and pelvis he considers the most frequent etiological factors in bladder hernia. Hypertrophy of the prostate, gravidity, and other conditions impeding the passage of the urine and causing dilatation of the bladder are remarkably often met with. My own experience has been that bladder hernia has been in no way associated with affections of the bladder.

As regards the age and sex, Eggenberger's table (including Brunner's cases) shows 241 cystoceles, of which, 168 were in the male, 73 in the female. It further shows that so far no cases of bladder hernia have been observed at the age of puberty. In men these herniæ occur most frequently between fifty and sixty years of age; in women, between thirty and forty years. In recent years there has been a relative increase of bladder hernia in women. Brenneisen gives the proportion of male to female cases as 3 to 1. Eggenberger's personal statistics shows 62 males and 40 females, or a proportion of about 3 to 2. I have observed only 2 cases of bladder hernia in the female to 12 cases in males.

Eggenberger found femoral hernia in women to occur with equal frequency on both sides. He reports 55 cases of inguinal and 5 cases of femoral hernia in the male, with 28 of the former on the right side, 21 on the left, 2 double, and 4 uncertain; of the femoral, 2 were on the right side, none on the left, 3 uncertain.

Of 40 bladder herniæ in the female, 15 were inguinal and 23 femoral hernia. Of the former, 10 were on the right side, 4 on the left, and 1 uncertain; of the femoral herniæ, 10 were on the right side, 10 on the left, 1 double, and 2 uncertain.

Eggenberger accepts Brünner's division of bladder herniæ into manifest and latent herniæ. The former, which constitute only one-tenth of all cases, show distinct phenomena and offer no difficulty as regards diagnosis, while in the latent variety the symptoms are but indistinct. These herniæ are discovered only during operation or at autopsy.

Cystoceles, as a rule, are irreducible; of the 110 cases of Eggenberger's statistics, only 19 were reducible, 10 partially reducible, 33 irreducible, 16 incarcerated, and about the remaining 32 no definite data are known.

Martin reported 28 cases of incarcerated bladder hernia, which he divides into four groups: 9 cases of extraperitoneal incarceration of the badder; 5 cases of paraperitoneal hernia in which the bladder, together with an empty hernial sac, was incarcerated; 3 cases with incom-

plete incarceration of the bladder; and 11 cases of incarcerated bladder-intestinal and bladder-omental hernia.

The prognosis of operation for manifest cystoceles is very good, and conservative treatment is contra-indicated in all cases causing discomfort to the patient. With latent cystoceles the mortality differs greatly between herniæ injured during operation and those not so injured; in the latter class it is practically nil, while in the former it is estimated at 6 to 16 per cent. In the cases of injury to the bladder which was overlooked during operation the mortality is 30 to 40 per cent. I have never opened or injured the bladder during operation, and all of the cases made uneventful recoveries.

Lumbar Hernia. Ruppaner[1] states that the number of the cases of lumbar hernia that have been anatomically examined, or operated upon, is so exceedingly small, that a brief report of his own case may be of interest.

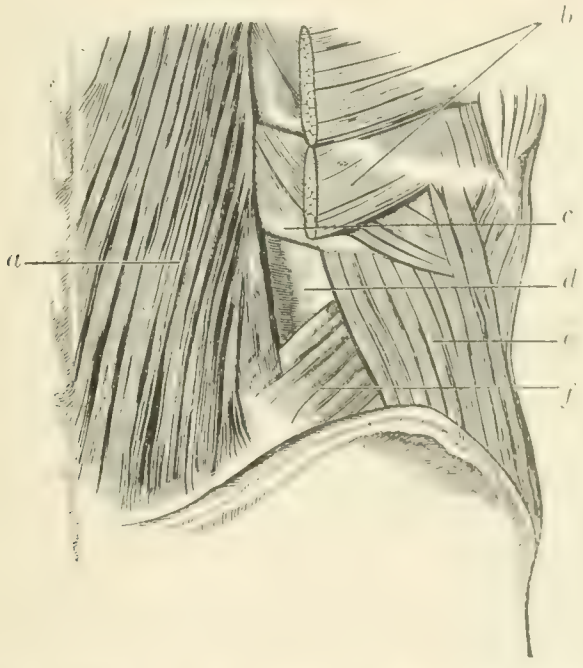

FIG. 21.—Rhomboid space of Grynfeltt; *a*, sacrospinalis muscle; *b*, posterior inferior serratus muscle; *c*, twelfth rib; *d*, lumbocosto-abdominal space of Grynfeltt; *e*, external oblique; *f*, internal oblique.

Paul Berger, in his well-known hernia statistics, comprising 16,800 hernias in 10,000 patients, cites but 2 such cases.

With regard to the probable outlet of the hernia in these cases, Ruppaner states there is as yet no unanimity of opinion among investigators. Petit's triangle has been considered the most frequent site of a lumbar hernia. Yet, he declares that the triangle is by no means as constant an occurrence as is generally supposed. He believes the so-called trigonum lumbale superius—the lumbocostal triangle of Grynfeltt or

[1] Deutsche Zeitschr. f. Chir., December, 1908.

the rhombus of Leeshaft—to be of much greater importance in this connection. This space is bounded by a portion of the twelfth rib and posterior inferior serratic muscle above, laterally by the oblique abdominal muscles; medially, there is the muscle mass of the erector trunci (sacrospinalis). The accompanying sketch shows the region just described. In view of the constant occurrence of this space, Baracz and Burzynski have given it the designation of spatium tendineum lumbale. They found this rhombus present 71 times in 76 cadavers, or in 93 per cent. The weakest spot is in the upper section, where the aponeurosis of the transverse abdominal muscle no longer receives support from the oblique muscle. At this point, a little below the last rib, the rhombus is nearly always perforated by a column of vascular nerves (the artery and vein and the subcostal nerve), and this section no doubt represents the weakest point of the lateral lumbar region.

However, various investigators have described different places as the weakest and hence most likely point of outlet for a lumbar hernia.

Congenital lumbar herniæ are due to arrested development and defective formation of the lumbar region. They usually appear immediately after birth or within the first months of life, and are often associated with other malformations. Eight cases of lateral abdominal hernia due to acute anterior poliomyelitis have been reported in the literature.

In acquired lumbar hernia, trauma, direct or indirect, plays an important role. Some authors hold that repeated pregnancy furnishes a predisposition to lumbar hernia. Sudden exertions, such as heavy lifting, are relatively frequently made responsible for lumbar hernia. These herniæ develop immediately after an injury. A cicatrix due to a penetrating injury, or post-traumatic abscess, very rarely gives rise to lumbar hernia. The last group of lumbar hernia, from an etiological standpoint, is formed by the class that develops spontaneously and includes all cases of doubtful origin.

The case reported by Ruppaner is a traumatic adipocele in the rhombus of Lesshaft, observed in a strong man, aged forty-five years, who, in lifting a heavy table, slipped. Severe pain in the lumbar region immediately followed, accompanied by belching and nausea. The patient was referred to the hospital. Examination showed the abdomen normal. In the left lumbar region, above the triangle of Petit there was great tenderness; externally, no change of configuration was noticeable in this region. There was no protrusion on coughing or straining. Careful palpation revealed a soft tumor, the size of a cherry, which could be pushed into the depth, producing a peculiar gurgling sound. After a week's observation without change in the condition, an operation was performed. An incision, 9 cm. in length, was made along the anterior border of the latissimus dorsi muscle, starting at the crest of the ileum. In the upper part of the wound the latissimus dorsi and the posterior inferior serratus muscles were drawn toward the middle,

so that the lateral border of the sacrolumbar muscle is almost reached. After drawing the posterior borders of the oblique muscles sideways, the lumbocostal fascia became visible. In this fascia there was a transverse opening about 1 cm. long, through which a fatty tumor the size of a cherry emerged. The same passed in and out of the opening with respiration. Changes pointing to an antecedent trauma were not noticeable. The transverse fibers of the aponeurosis were very thin and atrophic. Through the opening there was reached masses of retroperitoneal fat and medially the lateral borders of the quadratus lumborum. The lipoma, which was connected with the retroperitoneal fat by a broad pedicle, was reduced and the fascial aperture was closed with silk sutures. Over this were placed the oblique muscles, the posterior border of the external oblique being fixed under some tension to the lumbodorsal fascia at about the place where the deep and superficial sheath of the same meet. Primary union occurred. The patient was discharged from the hospital a week later, cured.

This case well illustrates the picture of a traumatic adipocele in the lumbar region. A real hernial sac was absent. The tumor consisted of nothing but subserous fat.

Jeannel collected 49 cases of acquired lumbar hernia with 3 autopsies and 6 operations. In these latter 9 cases, a hernial sac was found only in 5. In 5 other cases later operated upon, a hernial sac was found in but 2.

Ruppaner believes that upper lumbar herniæ are more frequent than those of the triangle of Petit. In his own case he thinks the hernia found its exit through a congenital aperture in the spatium tendineum lumbale.

As regards the diagnosis, Ruppaner states that a pronounced lumbar hernia is generally easily recognized. The diagnosis of adipoceles is somewhat more difficult, especially if they are reducible or adherent.

With regard to treatment, Ruppaner believes surgical therapy indicated in most cases. If the hernial opening is small, the same may be closed by suture; if large, plastic operations may have to be resorted to.

Baracz has suggested strengthening the rhombus of Lesshaft by means of a pedunculated muscle flap, formed out of the sacrolumbar muscle.

Diaphragmatic Hernia. A valuable contribution to the diagnosis and treatment of diaphragmatic hernia (chronic form) has been made by Cranwell, Professor of Surgery at Buenos Ayres.[1]

Cranwell points out that cases of chronic diaphragmatic hernia that have been diagnosticated and operated upon with satisfactory results are extremely rare. He himself reports one case in which the diagnosis was made and in which he performed an operation resulting in a radical cure. He believes that with the means of investigation now in our posses-

[1] Rev. de Chir., Paris, 1908, No. 1, p. 33.

sion the diagnosis should be relatively easy and operation should be followed by good results.

As to treatment, he recommends the method of operation which is shown by the accompanying cuts. His own patient was a chauffeur, aged twenty-four years. In November, 1904, while in a quarrel, he received a stab wound in the lower portion of the left chest wall. This was followed by severe pain in the region of the shoulder, and respiration was interfered with. The external wound healed by first intention. The pain in the shoulder continued; there was a peculiar bruit at the base of the left thorax which increased on deep respiration; it resembled the bruit produced by boiling water. The pain was augmented by deep inspiration and sometimes accompanied by coughing. A slight enlargement could be noticed at the base of the left thorax, and respiration was notably diminished at this place. On palpation anterolaterally one could perceive the bruit already described. On percussion one found the heart pushed to the right and a tympanitic area over the left base of the thorax, which was continuous with a tympanitic note of the abdomen and extended to the anterior axillary line as far as the third rib, and posteriorly as far as the ninth dorsal vertebra. The tympanitis was very variable and increased whenever the patient made deeper inspiration. Auscultation showed absence of a vesicular murmur in the tympanitic area. Radioscopic examination showed a dark transverse band, 3 cm. wide and 10 cm. long in the inferior left thorax. The diagnosis of diaphragmatic hernia of chronic variety was made, with prolapse probably of the omentum and colon. An operation was performed on July 18, 1906, two years after the injury. An incision was made, as shown in Fig. 22, through the skin, fascia, and muscles down to the ribs. A resection of 12 cm. of the ninth and eighth ribs was made which furnished ample access. On opening the pleura, the lung was found fixed by adhesions, which were easily detached. The omentum and transverse colon were found to have passed through an opening in the diaphragm and were occupying the lower part of the chest cavity. Numerous adhesions were present which were freed. The omentum was resected, the colon reduced into the abdominal cavity, and the diaphragm closed with interrupted sutures. The patient made an uneventful recovery.

Cranwell states that the great majority of diaphragmatic herniæ have no sac, the proportion being 248 without against 28 with a sac, according to Lacher.

As to the organs which are found in diaphragmatic hernia, according to Rochard,[1] in 330 cases, the stomach was found in 187; colon in 177; small intestine, 133; omentum, 107; spleen, 78; liver, 60; duodenum, 48; cecum, 35; pancreas, 32; kidney, 3.

In making the diagnosis, Cranwell places emphasis upon the tym-

[1] Les Hernie, Paris, 1904.

panitis, which in his own case was variable, increasing with forced inspiration, and upon the evidences furnished by auscultation, which are also very variable.

In the absence of antecedent trauma, the diagnosis presents very great difficulty, and this explains the fact that in the great majority of cases of congenital or acquired diaphragmatic hernia the diagnosis has been

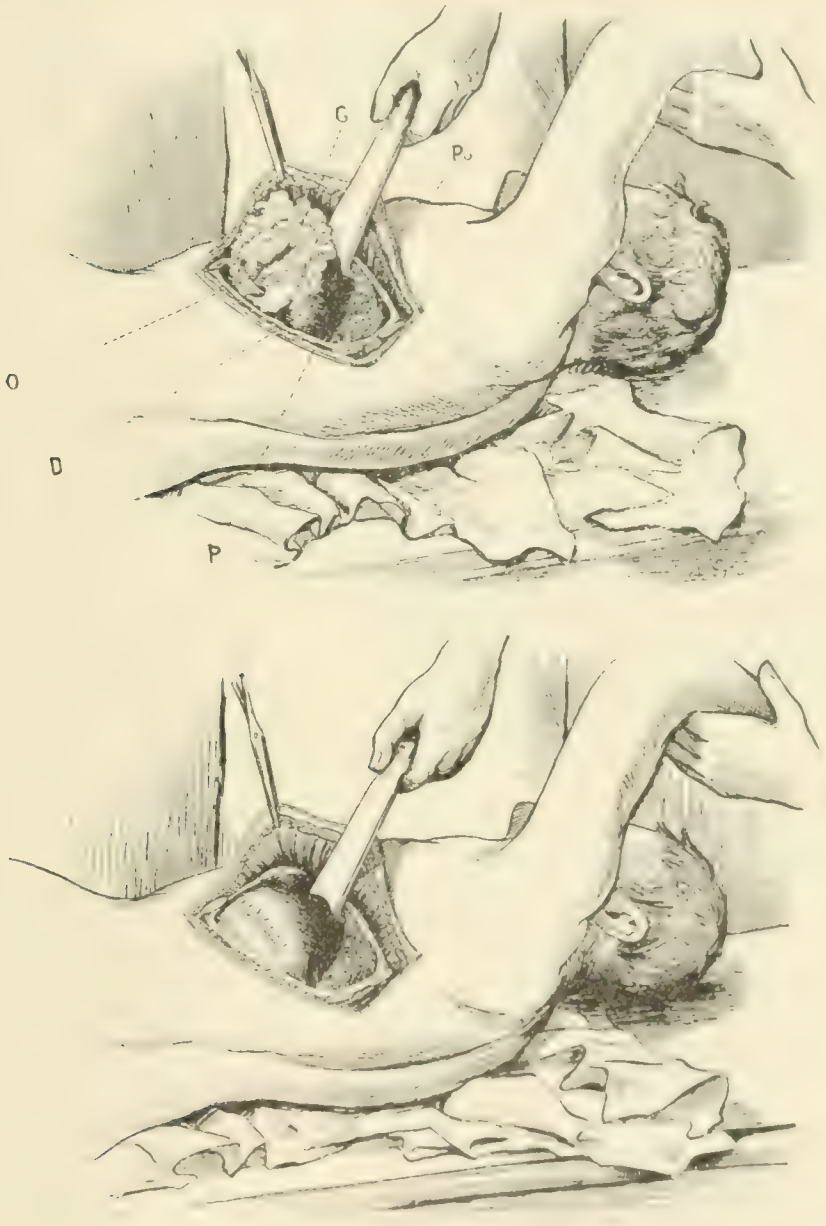

FIG. 22. — Diaphragmatic hernia operation.

made only at autopsy. He further believes that considerable help can be obtained by careful radioscopic examination, especially if the stomach forms the principal contents of the hernia.

In general he advocates operation for all diaphragmatic hernias, except when the general state of the patient contra-indicates such procedure.

According to the recent statistics of Vayhinger, a review of which has

already been given in Progressive Medicine (June, 1907), 26 cases of strangulated diaphragmatic hernia treated surgically showed 20 deaths and 6 cures; or, excepting 2, which were really not strangulated, only 4 cures, giving a mortality of 80 per cent.

Cranwell concluded that chronic diaphragmatic herniæ should always be treated by radical operation. The diagnosis of such herniæ is almost always possible from a careful study of the subjective symptoms as well as physical signs, furthermore, from the history of antecedent trauma. In cases of doubt, he would employ radioscopic examination. The transpleural method he considers the best for effecting a cure.

SURGERY OF THE ABDOMEN, EXCLUSIVE OF HERNIA.

By EDWARD MILTON FOOTE, M.D.

THE ABDOMEN IN GENERAL.

To one who follows the surgical literature of the world, it is evident that attention is more and more directed to the physiology of the patient, and less to the theoretical, mechanical, or clinical possibilities of new technique or new remedies. Hence, there is an increasing tendency to measure every new suggestion by this standard, and to determine, if possible, in what way it aids or hinders the physiological processes upon which the patient must depend for the preservation of his life. All the details of operative and postoperative treatment are passing under review and many things are being discarded as useless or harmful.

In the postoperative treatment following operations upon the abdomen, the most important things to be considered are: (1) Shock; (2) thrombosis and embolism; (3) ileus; (4) peritonitis; (5) the formation of adhesions. Some of the newer suggestions made during the past year will be considered under these five heads.

Shock in Abdominal Operations. The experiments of Mummery and Symes[1] show that the manipulation of the abdominal viscera is more productive of shock than are gross injuries, always providing the animals are fully anesthetized. Such manipulations produce shock most rapidly when they implicate the parietal peritoneum, the peritoneal ligaments, or the mesenteries. Shock is more readily produced under chloroform than under ether. In severe shock, hypodermic injections are but slowly, if at all, absorbed into the blood stream. In severe shock, intravenous injections of adrenin and of extract of the posterior lobe of the pituitary body raise arterial pressure to a greater extent than in the normal state. A single injection of the latter influences arterial tone for upward of an hour without producing abnormally high arterial pressure. This influence is sufficient to produce considerable recovery from shock, and does not interfere with subsequent injection of adrenin if that is desirable.

Early Rising after Laparotomy. Kümmell,[2] who is the best-known advocate of early rising after laparotomy, reports his experience with

[1] British Medical Journal, 1908, vol. ii. p. 790.

[2] Zentralblatt f. Chirurgie, 1908, Beilage, p. 4.

164 patients since January, 1908. The patients left their beds from one to three days after laparotomy. He includes under this term fifty operations for hernia. The other operations were as follows: For interval appendicitis, 56; for acute appendicitis, 20; for cyst of the ovaries, 7; for myoma, 4; Alexander-Adams operation, 8; cholecystectomy, 3; gastro-enterostomy and entero-anastomosis, 4. The others were exploratory laparotomies. In this series of 164 patients there was no case of post-operative embolus, and only one of thrombosis, and that in a mild degree. The development of the scar was prompt and firm.

In Kümmell's previous experience there had been about 1 per cent. of mortality due to postoperative embolism or thrombosis. The essentials for the carrying out of this treatment are as follows: (1) A perfect narcosis without vomiting or other complications; (2) quick operating and a minimum loss of blood; (3) firm and close suture of the fascia; (4) aseptic healing of the wound. Kümmell has observed no disadvantage following this method of treatment; on the contrary, disturbance of the activity of the intestine is much less, the patients feel better, their strength returns more promptly, the period of convalescence is shortened, and the scars are firmer than usual.

In a paper read at the last meeting of the American Medical Association, Frederick expressed his strong dissent from the extreme position taken by Kümmell and others. He believes, after trying both methods, that keeping a patient in bed for two weeks or longer after a laparotomy will lessen the number of subsequent ventral hernias; that it will give to many patients much needed rest; and that it affords the surgeon an opportunity to build up the strength of those who are debilitated.

In the discussion of this paper, Martin emphasized the necessity of considering the feelings of the patient. If he has a patient who wants to turn over in bed on the day following laparotomy, he allows her to do so. If she wants to get up on the third day or fourth day, she may do so. But in no case is the patient urged to make these advances. If there is any disorder of the lungs or heart the patient is observed with special care, and is not allowed so much liberty.

This last point is an important one, for in deciding for or against a prolonged rest in bed after laparotomy, one should not overlook the condition of the heart; on this even more than upon the condition of the wound itself depends the patient's ability to leave his bed with safety.

It is well recognized that acute infectious diseases often produce myocarditis to such an extent that the heart must be protected from overwork for some days or weeks after the fever has subsided. There is the same possibility of cardiac damage in cases of sepsis either before or after an operation, yet how often is this considered in deciding the ability of the patient to sit up? The surgeon looks at the wound, and if this is well healed, he is too apt to jump to the conclusion that the patient has practically recovered. In addition, he ought to convince himself

by direct examination that the area of cardiac dulness is not increased and that the pulse rate is not unduly elevated by bringing the patient into an erect position before he counsels him to leave his bed. If Kümmell's advice is followed, and these precautions are neglected, there will surely be occasional cases of sudden death, and more numerous cases of cardiac dilatation which might have been avoided. It is true that Kümmell, in his original paper,[1] excepts from his plan of early rising after laparotomy patients with sepsis. This he does apparently through fear of hernia, and not through fear of injury to the heart, since he does not mention myocarditis in his article.

Thrombosis and Embolism after Laparotomy. The frequency of postoperative embolism has sometimes been overlooked, but it has also been sometimes magnified by the advocates of some special form of postoperative treatment following laparotomy. The occurrence of such a complication doubtless varies much according to the different methods of technique and handling of patients employed in different hospitals.

Ranzi[2] has examined the records of 6871 patients operated upon in the Vienna Surgical Clinic during the last seven years. All of these operations were sufficiently serious to require the patients to remain in the hospital, so that their subsequent condition was accurately known. He found that there were pulmonary complications of an embolic character in 57 cases (or 0.82 per cent. of the whole). He divides them into three classes: Fatal; non-infected emboli of the lungs, 23 cases; pulmonary infarcts, 20 cases; suppurative embolic processes, 14 cases.

Emboli are most frequently found after laparotomies, radical operations for hernia, and extirpation of the rectum. A similar investigation made by Wolff of some 3000 operations in Königsberg showed a postoperative embolic involvement of the lungs in 0.7 per cent. of the cases. When laparotomies alone are considered, the percentage of pulmonary embolism is somewhat higher: In Vienna, 1772 cases, 1.35 per cent; in Munich, 1196 cases, 1.17 per cent. Other writers have reported percentages ranging from ½ to 2 per cent. of pulmonary embolism occurring after laparotomy. From the above, it appears that this complication, at least in German practice, may be expected in about 1 per cent. of laparotomies.

Fraenkel[3] says that nearly 5 per cent. of patients who are the subject of laparotomy acquire thrombosis, and nearly one-half of the thromboses are followed by embolism. Many postoperative pneumonias are embolic in character.

Postoperative thrombosis may be divided into two classes: that which affects the veins in the immediate vicinity of the operation, and is undoubtedly septic in character, and (2) that which affects veins far removed from the operative field, especially the veins of the left leg.

[1] Archiv f. klin. Chir., 1908, vol. lxxxvi, p. 494. [2] Ibid., vol. lxxxvii, p. 380.
[3] Zentralblatt f. Chirurgie, 1908, Beilage, p. 5.

In this class of cases the wound may heal aseptically, and the veins in its vicinity remain unaffected.

The etiology of the thrombosis in the second class of cases is in doubt. It has been attributed to feeble cardiac action, but it occurs in individuals who neither before nor after the operation gave evidence of poor circulation. It has been attributed to the anesthetic, but it may follow local anesthesia. It is worth remembering that persons with cardiac affections who are not operated upon rarely develop thrombosis. In view of these facts, it seems probable that this distant thrombosis is due to infection, even though it occurs some days after the operation, the wound itself having healed aseptically.

Postoperative parotitis is a similar phenomenon, occurring, like thrombosis, after laparotomy and gynecological operations. This is generally recognized as an infective process of the metastatic type, the origin of which is in the operative wound. Such secondary infection is well known under other circumstances, for example, osteomyelitis following tonsillitis or cutaneous suppuration. Tonsillitis and appendicitis may have the same relation.

In accordance with this metastatic theory, the pathogenic microörganisms which are common probably to every wound, escape through the lymph channels, and set up a metastatic thrombosis. Their feeble action is shown by the absence of thrombosis in the vicinity of the wound, and they may be still further enfeebled by their passage through the lymph glands. Metastatic thrombosis is more common after laparotomy, because the damage to the stomach and intestines favors the entrance of bacteria and toxins into the blood. The development of thrombosis during convalescence from *typhoid fever* is also of a metastatic type, and probably owes its origin to the intestinal paresis. This gastric and intestinal inactivity seems to lie at the base of metastatic thrombosis, the exciting cause for which is generally to be found in the operative wound, though in some cases infection may follow a tonsillitis.

The development of postoperative thrombosis is therefore a reflection to some extent upon the aseptic technique of the operator, who should strive to correct any lapses in the same. The best prevention after operation is the prompt restoration of the activity of the stomach and intestines. Respiratory exercises, massage, and leaving the bed early are insisted upon by certain operators to prevent postoperative thrombosis. Their chief value is in restoring the activity of the stomach and intestines.

The embolism may occur on any day from the day of operation up to a month or more thereafter. In one-half of Ranzi's cases the embolism developed within five days. The outcome was fatal in two-thirds of the cases in which embolism occurred. This is, therefore, a very serious complication, and though it is not a very common one, it is certainly worth every effort to understand its cause and how to avoid it. It is evident that degeneration of the muscle of the heart plays an important

part in the development of thrombosis, and that much attention ought to be paid to the action of the heart previous to operation, and an attempt made to strengthen it when it is weak; secondly, the quantity of anesthetic employed should be kept at a minimum, in order to reduce the strain upon the heart. After the operation, breathing exercises should be regularly employed; the position of the chest should be altered from time to time by raising the patient to a higher sitting posture for some portion of each day; while the circulation in the extremities should be improved by carefully administered massage and passive motions.

Several writers have urged that patients should leave their beds within a few days after laparotomy, and thus avoid the occurrence of pulmonary embolism and other pulmonary complications. Ranzi does not believe that this is a wise proceeding. Since one-half of his embolic complications occurred within five days after the operation, it would be necessary to get the patients up still earlier than this to have produced any good effect. The dangers of such a treatment he considers will outweigh the possible benefits, and I believe that most surgeons whose opinion carries weight with their fellows will agree with him. While it is doubtless true that a great many robust patients are able to get up a day after a laparotomy without inflicting damage upon themselves, these are not the patients in whom pulmonary complications are likely to occur; while to subject more delicate patients, or patients with suppurative processes requiring drainage, to such prompt and radical changes of position as a few men have advocated, will certainly produce more harm than good.

I should like to add to Ranzi's postoperative suggestions the additional one of turning the patient to one side or the other, allowing the patient to choose the one which gives him the least discomfort. This in most cases is the side upon which the operative work has been performed. Apparently the pressure of the abdominal organs against the wounded territory is not as disagreeable as their pull away from it. Thus, after operation for appendicitis a patient can often lie with comfort on the right side in two days, whereas he may not be able to lie with comfort upon the left side for a week. These changes in position have unquestionably a beneficial effect upon the digestive processes, as well as upon respiration.

When an embolism has occurred, the patient must be kept absolutely quiet, preferably by the administration of morphine, while the action of the heart is to be sustained by cardiac stimulants. The fatality of this complication is so great that, despite the serious nature of an operation under such circumstances, it has been proposed and actually carried out, and the emboli and thrombi extracted from the pulmonary arteries.[1]

The discussion which followed the reading of the papers by Kümmell and others showed a reluctance on the part of most operators to accept

[1] Progressive Medicine, December, 1908, p. 158.

the extreme position of Kümmell. Borelius found that many patients were unwilling to leave their beds even eight days after laparotomy. One patient operated on for appendicitis who got up on the eighth day, was obliged to return to bed two days later on account of signs of thrombosis, which passed over in six days without further complication. In the first three months of 1908 he made an attempt to carry out the early rising after 97 laparotomies, and in 43 cases he was able to reduce the length of stay in bed to an average of five days. The period of recovery was shortened in these cases, so that their stay in the hospital was thereby reduced—a point of some importance for institutions that are overcrowded.

In the past ten years there have been performed in the surgical clinic in Lund, 1808 laparotomies, with a postoperative mortality from pneumonia of 1.3 per cent. and from pulmonary embolism of 0.4 per cent.

Meinert believes that most postoperative thromboses are due to thickening of the blood as a result of loss of fluid during the operation. Its prevention is to be secured by increasing the water introduced into the system before and during the operation.

Müller has practised resection of the thrombosed saphenous vein in order to prevent embolism. Gebele believes in the use of strophanthus and pulmonary respiratory exercises. He believes that early rising following the operation may produce embolism.

Henle said that early rising had produced bad results in the Breslau Clinic, where the patients are now allowed to remain in bed two weeks following laparotomy. He looks on massage of the lower extremities as a prophylactic measure.

Hochenegg believes that postoperative thrombosis is due to infection through the intestines. The early administration of laxatives is therefore indicated.

Körte believes that embolism may be produced from some harmless thrombus by early rising.

Heller lets those patients get up promptly in whom the laparotomy wound is above the umbilicus.

Lobker thinks that the loss of blood should be promptly corrected by subcutaneous saline injections, etc.

Eiselsberg has found that early rising is extremely disagreeable for most patients, and he therefore allows them to remain in bed for two weeks.

Postoperative Ileus. Cases of postoperative ileus are divided by Deaver[1] into three classes: (1) Those following immediately after operation; (2) those due to mechanical intestinal obstruction; (3) those due to septic peritonitis.

Obstruction following immediately after operation is almost always due to excessive handling of the viscera, especially if the operation has

[1] New York State Journal of Medicine, 1908, vol. viii, p. 459.

been prolonged. Prolonged anesthesia and exposure of the intestine to the air has been shown by experiments to produce a certain amount of intestinal paresis, but the effects of handling are much more severe. Under handling, one must include the careless placing of retractors or gauze pads or drains. One must be not only aseptic, but gentle, to get the best results in work within the abdomen.

Postoperative ileus due to mechanical intestinal obstruction is usually due to excessive adhesions produced by rough handling or sepsis. Imperfect drainage is responsible for many of these cases.

Postoperative ileus due to sepsis is more common than both the other forms combined. Usually the peritonitis exists at the time of operation, and if it is spread thereby, interference with the passage of the bowels may readily result.

The diagnosis between these three forms is often difficult. Immediately after an operation we may be in doubt as to the existence of the first or third form. In peritonitis the invasion is early, and pain, restlessness, and anxiety are observed from the first. Vomiting is an early symptom; meteorism is general; the temperature is elevated. Mechanical ileus has a delayed onset from a few days to several weeks after operation. The onset is sudden, the pain sharp and well localized. Tenderness and meteorism are at first confined to one region; vomiting may not come on at once, but is conspicuous as the case progresses.

When postoperative mechanical intestinal obstruction is really present, surgical interference is the only hope of the patient. Its object is twofold: to relieve the cause of the obstruction and to establish or reëstablish sufficient drainage when infection is present.

Scudder[1] says that if there is doubt about a diagnosis of acute intestinal obstruction, and the patient has "abdominal pain without involuntary muscle spasm, is distended without a temperature, *no cathartics* should be given by the mouth. If there is a beginning peritonitis, it will be increased by the catharsis. If there is infection in any part of the abdomen, the increased peristalsis occasioned by the cathartic will spread the infection to another part of the abdomen.

"More harm is caused by the common practice of administering cathartics in cases of abdominal pain in which the diagnosis is uncertain than in almost any other way.

"No massage should be given to the abdomen for fear of causing a perforation or of spreading the infection. The patient should be kept in bed and kept quiet. No food should be administered by mouth for fear of causing intestinal peristalsis and thus increasing the peritonitis. No water should be allowed to be swallowed, for very little water is absorbed directly from the stomach and the swallowing of water increases peristalsis. No morphine should be given until operation is decided

[1] Boston Medical and Surgical Journal, 1908, vol. clix, p. 491

upon or the diagnosis is made, for morphine will conceal symptoms. If there is vomiting, the stomach should be washed out with warm water. Neither food, nor cathartics, nor morphine should be given in suspected intestinal obstruction."

Postoperative ileus has often been ascribed to adhesions, and, without doubt, correctly so in many cases; yet the occurrence within the knowledge of one pathologist of three instances in which different well-known German surgeons have produced fatal postoperative ileus by means of a through-and-through suture, makes one wonder whether such sutures may not have been at fault in some of the cases of supposedly fatal adhesions. The accompanying figure from Fischer's article[1] (Fig. 23)

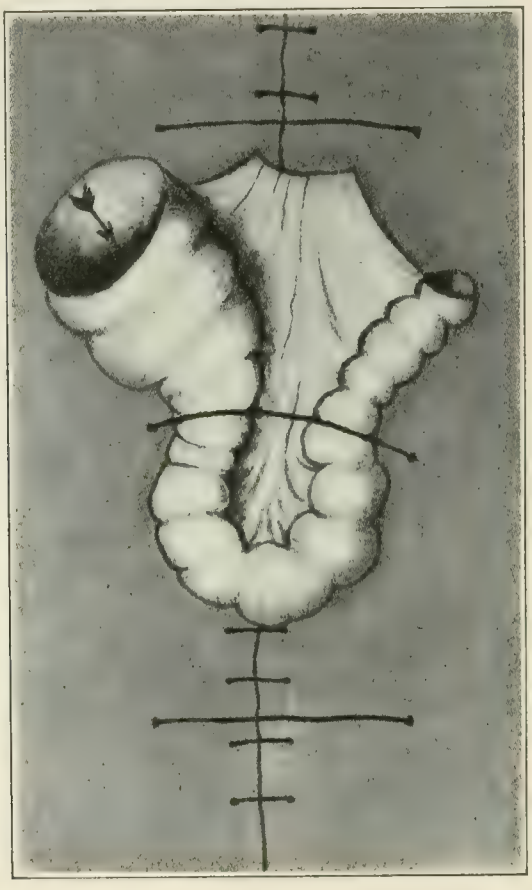

Fig. 23.—Constriction of a loop of small intestine by a through-and-through suture. Fatal ileus produced. The inner side of the abdominal wall is shown. (Fischer.)

represents the conditions of affairs shown at autopsy, the view being from within the abdominal cavity. In all three cases the small intestine, jejunum, or ileum was the portion strangulated. Fischer is of the opinion that this cause of ileus might be more frequently recognized if the abdomen were opened by a pathologist at some other point than the operative wound, the stitches of the same being left in place until examined from within.

Besides these three fatal cases, Fischer has seen a number of instances

[1] Deut. Zeit. f. Chir., 1908, vol. xciv, p. 107.

in which one or more coils of intestine have been fixed to the abdominal wound by means of a through-and-through suture. Even though perforation does not follow this accident, the paralysis of the intestines which may be thereby produced may be sufficient to turn the balance in favor of death rather than recovery.

It does not appear from the description of these cases exactly how the strangulation took place. In every case the stitch traversed the peritoneal cavity for a distance of 6 to 10 cm. (two and one-half to four inches). Fischer suggests that these sutures, which in his three autopsies were all of silver wire, were first introduced and were not drawn taut until the abdominal wound was closed by the fine sutures, and that this lapse of time gave opportunity for a loop of intestine to slip under the stitch. He also suggests a second possibility that the abdomen was distended at the time the sutures were inserted, and that later, owing to the escape of gas and feces, this distention was relieved, and that it was possible for an intestinal loop to slip in under the relaxed suture. Whatever the method of occurrence, it is obvious that under no circumstances should a suture be introduced into the peritoneal cavity and carried across a distance of two inches or more. Those who employ removable tension sutures should see to it that they do not enter the peritoneal cavity at all.

Perforative Peritonitis.—When the surgeon is able to control perforative peritonitis in such a manner as to prevent death with as much certainty as can be done in many other conditions, one of the chief subjects of surgical literature will become an old story. Murphy[1] believes that such a day is clearly in sight. He reports a series of 49 cases of peritonitis. In 2 of them the peritonitis was due to gastric perforation; in 1 to duodenal; in 4 to typhoidal; and in 42 to appendicular perforation. Only 2 patients died, 1 from double pneumonia, and 1 from mechanical ileus. In this series he has included only such cases of spreading free peritonitis as result (*a*) from direct communication of the alimentary canal into the free peritoneal cavity, and (*b*) perforations of the appendix with primary retention of the infective material in a circumscribed zone, and subsequent rupture into the free peritoneal cavity.

The severity of these cases may be estimated from the fact that 7 had to be reoperated on for circumscribed accumulations of pus in various parts of the abdomen, and 6 had to be reoperated for mechanical ileus. With a mortality so slight (4 per cent.), it is worth inquiring what is the method of treatment employed by this operator. Septic intoxication, he says, is the most frequent cause of death in perforative peritonitis, and the prevention of absorption is therefore of the greatest importance. Hence, the moment the diagnosis is made, the patient should be placed in the Fowler position, and kept so until convalescence is well advanced, being carried

[1] Transactions of the American Surgical Association, 1908, p. 16

in this position to the operating room. Even during the operation the shoulders should be well elevated. Peristaltic rest is favored by withholding food and the application of cold to the abdomen. Opium is objectionable, and, besides, its use tends toward delay of the operation. Gastric lavage immediately before the operation, with an intravenous injection of two to four pints of normal salt solution in intensely poisoned cases, improve the condition of the patient. Ether is given by the drop method on the operating table. In no case was more than seven minutes consumed before complete relaxation was obtained.

The incision is made over the seat of perforation, or if this is not known, it is made slightly to the right of the median line. The leak when found should be rapidly closed. If it is in the appendix, the base is firmly clamped and ligated in the crease thus made, and the organ amputated. Burial of the stump requires too much time and manipulation, and should therefore be rejected. If the leak is due to a gastric or intestinal ulcer, it should be closed by a double or triple row of Lembert sutures. If induration renders this impossible, an adjoining loop of intestine should be stitched over it. Simple drainage of a perforation without closure of the opening in the stomach or duodenum leads to almost certain death. Irrigation of the peritoneal cavity should be discarded. It prolongs the operation, necessitates more or less evisceration, traumatizes the peritoneum, and spreads the infection everywhere.

The relief of pus tension is the first surgical step toward retarding absorption in all acute infections. The reduction of tension must be initial, but the absence of pressure continuous. These measures are secured by drainage. Murphy inserts fenestrated or split rubber tubes to the stump of the appendix or the site of the ulcer, and into the vesical, rectal, or Douglas' pouch, and into any other pus pockets that may exist. The abdomen is often closed with pints of pus still in its cavity. Its low pus tension is maintained by the tubes, which may discharge pus for days, or in some cases for only a short period. The entire technique should be accomplished in a few minutes, since time is vital in these cases.

As soon as the patient is returned to bed, proctoclysis is instituted and maintained until the serious symptoms of intoxication cease. The normal salt solution should be administered through a fountain syringe, to which is attached a $\frac{3}{8}$-inch rubber hose, fitted with a hard rubber or glass vaginal douche tip with multiple openings. This douche nozzle should be flexed almost to right angles three inches from its tip. A straight tube must not be used, since it produces pressure on the posterior wall of the rectum when the patient is in Fowler's position. The nozzle is inserted up to its angle, and secured by strips of adhesive plaster to the sides of the thigh. The rubber hose is passed under the clothes to the head or foot of the bed. The reservoir—preferably a glass or a graduated can, so that the flow can be estimated—is elevated from six to fourteen inches above the buttocks. The flow must be controlled by gravity alone, and never by

forceps or constriction on the tube; so that if the patient endeavors to void flatus, or strains, the fluid can rapidly flow back into the reservoir; otherwise it will be discharged into the bed. The can should be just high enough to permit the escape of one and one-half pints in forty to sixty minutes. It should be refilled every two hours. The tube should not be removed from the rectum for two or three days. Proctoclysis restores blood pressure, improves the capillary circulation, quiets the thirst, eliminates the septic products, and increases the excretions.

If the patient has a tendency to vomit, or is nauseated, or shows evidence of gastric dilatation, lavage should be practised and repeated often if the stomach refills with fluid. Murphy has used streptolytic serum in a large percentage of cases, giving 20 c.c. immediately after the operation, and again each twenty-four hours, until the patient is out of danger. The dressings are changed as often as is necessary, the drainage tubes being rotated every twenty-four hours, to prevent closure of the fenestras by adherence of omentum or intestine. Opium and its derivatives and coal-tar anodynes are never given either before or after operation.

Postoperative ileus is a frequent and often dangerous complication. If of the adynamic type, due to paresis of the intestine as a result of the peritonitis, there is tympany with pains, but rarely nausea and vomiting. If the latter appear, gastric lavage must be practised. Peristalsis may be stimulated in the large intestine by high enemas containing one-half ounce of dried alum to a quart of water; or salicylate of physostigmine may be injected hypodermically every two hours, in doses of $\frac{1}{60}$ to $\frac{1}{40}$ grain; or atropine sulphate, $\frac{1}{60}$ grain, may be injected every three hours. If these methods fail, the possibility of a mechanical ileus should be considered.

The clinical picture of mechanical ileus is one of wave-like and colicky pain, with increasing frequency, and of vomiting until it becomes a gulp every two or three minutes. The amount of the distention depends somewhat upon the length of the intestine above the seat of obstruction. For a time there is stormy peristalsis, dying down as the intestine becomes fatigued. Gastric lavage may stop the vomiting and give a false sense of security. In three of Murphy's cases of postoperative mechanical ileus, removal of the stitches and incision of the adjacent intestinal coil relieved the ileus. Resulting fecal fistulas healed spontaneously in a few weeks.

The period of time that elapsed between perforation and operation was, in the gastric cases which he reported, eight to fourteen hours respectively; in the duodenal case, eight hours; and in the appendicular cases, as nearly as could be judged, from three to forty hours. In many of these cases the appendicitis had lasted for three or four days, or possibly longer, before perforation took place.

In the discussion of this paper, Deaver said that he does not hesitate to reopen the abdomen if a patient has sepsis following laparotomy. Thus

far he has invariably found an obstruction which he has been able to relieve, with the recovery of the patient. He never employs morphine.

Gerster is not enthusiastic regarding the use of *eserin*. He sees better results from the irrigation of the rectum through a soft rubber tube passed high up. After the fluid is allowed to escape, there is a slight pause, and the injection is repeated. In this manner from two to four gallons of water are used. This treatment provokes peristalsis and the expulsion of large quantities of gas. He looks upon Murphy's attitude in regard to morphine as extreme.

Devan prefers nitrous oxide gas to ether or chloroform in septic peritonitic cases. He is an advocate of quick irrigation through tubes, which he usually performs while closing the abdominal wound. He prefers large cigarette drains to rubber ones, since the latter may cause pressure necrosis.

Allen usually irrigates in suppurative appendicitis as soon as the abdomen is opened, turning the patient on the right side for the purpose, and washing out through two glass tubes. The operation is performed with the patient upon the right side, and the patient is put into bed in this position. Drainage is thus maintained at the most dependent point of the abdomen, and Allen believes this lateral position to be more comfortable than the Fowler position.

Armstrong says that we must look to bacteriology for an explanation of the good results obtained by Murphy's plan of treatment. Bacteria tend to die out. They are constantly producing toxins that sooner or later cause their death. When we open the abdominal cavity and wash out the pus, we also wash out the accumulated toxins which are killing the bacteria. The bacteria then have a fresh start in a clean field. Drainage in the upright position relieves tension, and so favors the reëstablishment of the circulation, and gives the phagocytes a chance to do their work. Armstrong mentioned the occurrence of distention in the epigastric region accompanied by distress and vomiting in two patients who had been in Fowler's position for several days. Believing that the distress was due to arteriomesenteric pressure on the duodenum, he placed the patients in Trendelenburg's position, when the symptoms promptly disappeared.

Maurice Richardson has not observed much if any improvement in the results of acute general peritonitis under full headway, although there has been an encouraging improvement in the control of beginning infection or of infections just getting headway. His plan of treatment in operating upon a locally infected region is to wall off the field of operation with large masses of gauze, which absorb existing fluids and any that may escape during the operation. This confines the fresh infection to the limited area of its original focus, and relieves the peritoneum of the greater part of the infected exudate. The one thing that makes the present treatment of peritonitis so successful is the education of the general practitioner in the importance of early diagnosis and operation.

Harte says that many who think they employ Murphy's method fail to do so, because they use too small a tube and elevate the reservoir too high. Moreover, Fowler's position cannot be successfully employed unless, by means of a frame or other device, the weight of the patient can rest upon his buttocks and thighs; otherwise, he will slide down in the bed.

Moynihan is convinced that the Murphy treatment is of a value that it would be hard to overestimate. He operates usually under stovain, with lumbar anesthesia. As soon as its influence is felt he patient begins to pass abundant quantities of gas. This improves his condition and makes the operation easier. An exaggerated Fowler's position is maintained by a hard bolster put beneath the thighs and strapped to the head of the bed. Water is kept constantly by the patient's side, and he takes all he wishes. A small dose of morphine is given by hypodermic before the patient leaves the operating table—but none afterward.

McGuire[1] makes a commendable effort to bring about uniformity in the classification of cases of peritonitis. By the term septic peritonitis he designates those cases in which the pyogenic infection is so acute and virulent that the patient dies before sufficient time has elapsed for pus to form.

In local suppurative peritonitis the infection is of such a character that nature has time to form adhesions which confine the pus to a limited portion of the peritoneal cavity.

The term "diffuse suppurative peritonitis" should be reserved for cases in which the infection is less virulent than in septic peritonitis, but more acute than in local suppurative peritonitis. In other words, there is time for pus to form, but not time for Nature to wall it in by adhesions.

The term "general suppurative peritonitis" should be discarded. Its use has led to much confusion.

McGuire believes thoroughly in the Fowler-Murphy method of post-operative treatment. The accompanying illustration shows the aparatus employed for the elevation of the bed (Fig. 24).

Elevating the head of the bed has certain advantages over elevating the patient, in that the patient lies on a flat surface; he is completely relaxed and easily nursed, and the angle of elevation may be changed at any time without disturbing the patient.

In the last 500 cases of appendicitis operated upon in McGuire's private hospital there were 24 who had diffuse suppurative peritonitis. The first 6 were treated by the old method of irrigation and multiple drainage, with 5 deaths. The last 18 were treated by the Fowler-Murphy method, with but 1 death.

Gilliam[2] makes use of an adjustable canvas chair, similar to a steamer chair, in order to keep a patient comfortably and surely in the Fowler

[1] Journal of the American Medical Association, 1908, vol. l, p. 1019.

[2] Ibid., vol. li, p. 1133.

position. He removes the canvas and substitutes rubber sheeting for the sake of cleanliness.

Eisendrath[1] has devised an apparatus which is intended to keep the solution warm while Murphy's plan of postoperative treatment, by continued rectal injection, is being carried out. The apparatus is similar to that employed in laboratories to keep an agar solution hot during filtration, and consists in a glass irrigator surrounded by a water jacket. Heat can be kept up by means of electricity or an alcohol lamp.

FIG. 24.—Elevation of bed to obtain the Fowler position. (McGuire.)

DIAGNOSIS OF DIFFUSE PERITONITIS. McDonald,[2] in speaking of the signs of diffuse peritonitis, says that rigidity is the most reliable early symptom. Its existence on one or both sides is usually an indication that the inflammation occupies the same area. The first pain in peritonitis is due to the lymphangitis. Indeed, there may be the same pain without peritonitis, as is seen in non-perforating ulcers of typhoid.

[1] Journal of the American Medical Association, 1908, vol. li, p. 406.

[2] New York State Journal of Medicine, 1908, vol. viii, p. 402.

Later, there is added pain due to the direct irritation of the peritoneum, especially the parietal portion. Vomiting is another early symptom, regurgitant at first, later becoming persistent, and bile or blood-stained, or fecal in character.

The character of the temperature curve varies according to the virulence of the organism causing the peritonitis.

Tuberculous Peritonitis. Hamman[1] gives a statistical report of 150 cases of tuberculous peritonitis occurring in the various services of the Johns Hopkins Hospital; 35 of these were between ten and twenty years of age; 54 between twenty and thirty; and 28 between thirty and forty. One-half of his cases were in the colored race, which shows the frequency of the occurrence of this disease among negroes, since the white patients in the hospital greatly outnumbered the negroes. In about one-third of the cases there was a tuberculous family history.

In regard to symptoms, it is stated that 104 patients had at some time abdominal pain. There was fluid in the abdomen in 62 cases; abdominal masses in 55 cases; 48 were constipated; 42 had vomiting; 33 had diarrhea; 6 had blood in the stools; 4 had alternating diarrhea and constipation; 47 had cough, dyspnea, or some other evidence of pulmonary disease. In uncomplicated cases of tuberculous peritonitis there is no leukocytosis.

From these figures it appears that tuberculous peritonitis is almost always secondary to disease in some other part of the body. This was shown still more strikingly by the records of the 35 autopsies which were performed. In only one instance did the examiner fail to find an original focus outside of the peritoneum. In four-fifths of the autopsies some serous membrane other than the peritoneum was also involved. The prognosis, according to these records, is not good. The immediate mortality was 32 per cent. (48 cases); 15 left the hospital unimproved, 71 improved, and 16 well. Only 43 of this list could be traced, of whom 14 were dead, 7 were ill, and 22 were well.

Adhesions after Laparotomy. The power of serous surfaces of the peritoneum to adhere quickly when irritated is a life-saving function; indeed, one might almost say that abdominal surgery rests upon it. It gives safety to the Lembert suture, and by it the omentum is able to protect many perforations in the stomach and small intestine. Furthermore, it limits the spread of infection to any portion of the abdominal cavity. But when adhesions form extensively, especially as a result of inflammation, they may greatly interfere with the activity of the intestines and cause the patient much needless pain. Hence for years attempts have been made to limit their formation after laparotomy. Most diverse methods have been used for this purpose. Applications of collodion, goldbeater's skin, silk protector, tallow, paraffin, egg albumin, gum

[1] Johns Hopkins Hospital Bulletin, 1908, p. 256.

arabic, etc., are all so crude in the light of our present knowledge of physiology that it is unnecessary to mention the details of their failure.

Many have hoped by increasing the peristaltic action of the intestine to prevent the formation of adhesions. Others have introduced fluids, such as olive oil, lanolin, agar, gelatin, and fibrolysin. A series of experiments undertaken by Bosch and Bibergeil[1] upon cats throws some light upon this subject. They proved absolutely, so far as such experiments can prove, that it is not possible to prevent the formation of adhesions by smearing the serous surfaces with any sort of sticky or oily substance. Some of the substances employed were themselves irritating, as lanolin, paraffin, oil, agar, and carragen. Other substances, such as solution of gum arabic, gelatin, and fibrolysin, were resorbed before a complete regeneration of the endothelium of the serosa could take place. Secondly, they proved that adhesions may follow rough handling of the peritoneum, rubbing with dry sponges, etc. This point is, of course, not new, but it is worth emphasizing, because certain writers have claimed that chemical irritation or infection was necessary for the formation of adhesions. The least irritating form of sponge is one that is boiled in a normal salt solution, and used wet.

Blake, of Boston,[2] has tested the use of sterile oil in the peritoneal cavity of human beings and cats in order to determine its effect in preventing adhesions. He found that it has a very limited action of this character, that in man it remains in the peritoneal cavity from five to fifteen days, and that it produces no unpleasant symptoms, local or general, if employed in small quantities (1 to 4 drams). The oil employed was olive oil. The greatest care must be exercised in sterilizing it. It should be boiled at least one hour.

Vogel[3] is an enthusiastic advocate of *physostigmine* injected subcutaneously after laparotomy, which he uses generally in a dose of 1 mg. ($\frac{1}{60}$ grain), following it one hour later with a rectal injection of glycerin. He believes that in this manner the formation of adhesions may be prevented. This may be given immediately after the operation, or on a subsequent day when symptoms of intestinal stasis begin to show themselves.

Vogel objects to the routine practice of giving to all patients strong laxatives immediately before a laparotomy. The desirability of removing from the intestine old, formed fecal masses is beyond question, but this should be done long enough before the operation to allow the intestine to become quiet. Everybody knows the weakening effect of diarrhea in health, and to produce this condition immediately before an operation must be disadvantageous to the patient. The reaction which follows

[1] Archiv f. klin. Chirurgie, 1908, vol. lxxxvii, p. 99.

[2] Transactions of the American Surgical Association, 1908, vol. xxvi, p. 3.

[3] Mitteilungen aus den Grenzgebieten der Medicin und Chirurgie, 1907, vol. xvii, p. 597.

such an exaggerated peristalsis before operation makes it more difficult to stimulate peristalsis after operation.

The presence in the intestine of normal fecal matter is the physiological stimulus for peristaltic action. If the intestine has been absolutely emptied by repeated laxatives and starvation previous to operation, it is more difficult to excite its action by drugs afterward, so that formation of adhesions may be favored rather than prevented by excessive catharsis before the operation. There is a great difference in individuals in the formation of postoperative adhesions, so that definite conclusions cannot be drawn from a few cases, and the opinion of Vogel in regard to the beneficial action of physostigmine has not been everywhere accepted; but those who use this regularly seem well satisfied that it prevents postoperative ileus, whatever may be its influence upon the formation of adhesions.

Oxygen and Adhesions. I spoke last year of the use of oxygen in the abdominal cavity to combat shock and to prevent the occurrence of adhesions. Additional testimony on this subject has been produced during the past year. Meeker,[1] who undertook a series of experiments upon cats to determine the effect of oxygen in the abdominal cavity, scarified the parietal and visceral peritoneum, and in some instances sutured these surfaces together, in order to make sure that they would remain in contact. The experiments were performed in duplicate, the abdomens of the cats being distended by 200 to 300 c.c. of oxygen. The animals were examined after two to four days, In every instance in which no oxygen was employed there were abundant adhesions both in the visceral and parietal peritoneum. In the animals treated with oxygen there were in most cases no adhesions; in a few there were fine cobwebs. Meeker explains these results as follows: (1) That the oxygen mechanically held the scarified surfaces apart until new cells had been formed; (2) that the oxygen increased the activity of the individual cells, thus hastening a newgrowth of epithelium to replace the destroyed peritoneal cells, the denuded areas being thus covered over; (3) that the increased peristalsis caused by the oxygen was unfavorable to the production of adhesions.

Burkhardt[2] says that there is no known means of hastening peritoneal absorption, although it may be slowed in a number of ways. This is often an advantage to the patient in his judgment, as in the presence of inflammation there will be a slower resorption of the toxins. He has experimented with pure oxygen in the peritoneal cavity of rabbits, and finds that it produces an initial hyperemia and irritation of the serosa. He believes that any beneficial action which it may have in delaying or preventing peritonitis is due to the delayed resorption produced by it.

[1] New York State Journal of Medicine, 1908, vol. viii, p. 281.

[2] Deut. Zeit. f. Chir., 1908, vol. xciii, p. 182.

He experimented upon forty rabbits, exciting peritonitis by injections of direct cultures of bacteria, or by allowing the contents of the intestines to escape into the peritoneum for a time. Oxygen was then injected two or three times a day, as fast as it was resorbed. Eleven of the animals so treated with oxygen recovered, while only seven of the control animals similarly infected recovered.

Burkhardt concludes from this that oxygen is not by any means a cure for peritonitis, but that it produces a hyperleukocytosis and increased formation of protective substances against the infection at the same time that it delays resorption of the peritoneum. In a few cases he exposed the animals to the influence of the *x*-rays for three-quarters of an hour after the oxygen had been injected. In one series of cases two rabbits recovered with oxygen, and two died without it; while in another series, in which a more virulent culture of staphylococci was introduced, all four animals died. The influence of the *x*-rays changes the oxygen into ozone, and a more powerful action is obtained thereby.

Tuberculosis of the Mesenteric Lymph Glands. It is well established that the tubercle bacilli can pass through a healthy intestinal mucous membrane and find lodgement in the lymph glands of the mesentery. In this manner are to be explained the cases of primary tuberculosis of these glands which are from time to time reported. The result is the development of a tumor which may be the first abnormality observed. Usually, however, the patient notices at first pain, and then various disturbances of the digestion, such as constipation, vomiting, or diarrhea. Emaciation follows, a fact which greatly facilitates the exact palpation of the tumor. It is movable, nodular, slightly tender on pressure, and lies principally upon the right side. It is easily differentiated from the various abdominal organs, and in certain cases its pedicle can be made out.

Reports of a number of cases collected by Machtle[1] show that the infected mass of lymph glands may safely be removed by operation, thus curing the patient of his tumor, and at the same time ridding him of the dangerous source of general infection. In some cases it is advisable to resect a portion of the intestine, together with the corresponding lymph nodes. In others the removal of the nodes themselves is possible. At the time of operation the glands are frequently caseated, so that there is possibility of rupture during removal.

Omentum Used as a Mesentery. It is well known that the intestine cannot be deprived of its mesentery for any considerable distance and live. It has also been demonstrated that division of the mesentery at a distance from the intestine is less fatal than if the division is made nearer the intestine. Presumably in the former case there is more opportunity for anastomosis to supply the affected intestine with the necessary blood.

[1] Beiträge f. klin. Chir., 1908, vol. lix, p. 50.

Scudder[1] has made some experiments upon dogs in order to determine whether suture of the omentum to a portion of the intestine deprived of its mesentery will preserve its life. He found that it will do so, but only to a limited extent, so that this method cannot be relied upon in operating upon the human subject, although in some cases of threatened loss of vitality it may serve to avert a catastrophe. Wide attachment is of more service than a slight one.

Omental Cysts. Hasbrouck[2] makes a distinction between cysts occurring in the cavity of the great omentum, and other cysts attached to the omentum but not so situated. Many of the latter may have started in the ovary or elsewhere, and have become attached to the omentum secondarily. The cysts of the omental cavity proper are of a uniform type, originating, according to this writer, as endotheliomata, which with growth become cystic. They are rare tumors, Hasbrouck's case making the twentieth on record.

The symptoms are as follows: Moderate pain, weight, and dyspnea; gastric disturbances, such as nausea, vomiting, and anorexia in some cases, constipation and irregular action of the bladder, due to pressure. Emaciation is a late symptom. From this it appears that diagnosis is difficult or impossible. Some of the mistaken diagnoses have been lipoma, ascites, ovarian cyst, aortic aneurysm, hydatid cyst of the liver, cyst of the urachus, of the mesentery, of the pancreas, and tuberculous peritonitis.

Fort[3] reports what he believes to be the twenty-second case of true omental cyst on record. His patient was a female child, aged two and one-half years. The diagnosis made before operation was merely that of abdominal distention by fluid, five pints of which were removed by aspiration. The fluid was stained dark by blood. Five days later the abdomen was opened, and the fluid was seen to lie between the folds of the great omentum. There was a fairly distinct capsule. The whole omentum being involved, it was resected. The child recovered promptly.

Enteroptosis. Clark[4] speaks of the surgical treatment of cases of enteroptosis, in which medical and mechanical means of relief have failed. It is only when such measures have been tried without success that one should resort to surgery. He warns against operation, merely because a patient has a splanchnoptosis. Such indiscriminate operating is no more likely to benefit the patient than is the indiscriminate anchoring of movable kidneys when they happen to exist in neurasthenics. Cases of ptosis due to congenital habitus will not be relieved by operation, except in the rarest instances. In order to arrive at an accurate estimate of the degree of ptosis, the *x*-rays should be employed.

In cases following childbirth, where the abdominal wall is very lax,

[1] Boston Medical and Surgical Journal, 1908, vol. clix, p. 338.
[2] Annals of Surgery, 1908, vol. xlviii, p. 207. [3] Ibid., 1907, vol. xlv, p. 382.
[4] Surgery, Gynecology, and Obstetrics, 1908, vol. vi, p. 339.

resection of a portion of it may give relief, provided the diastasis has not been of such long standing that the abdominal organs are far below their former level. A greatly depressed colon may be suspended by means of the omentum, but if it forms a pendulous loop, and there is evident stasis of the fecal current, resection and end-to-end anastomosis will cure the patient. Similar treatment should be accorded the sigmoid. In all cases a carefully fitted abdominal support or straight front corset should be worn after operation.

Location of Abdominal Pain. It has recently become customary to affirm that there is no sensation in the abdominal organs, and hence no possibility of pain in them, and that all pain which is referred to them is really produced in the posterior peritoneum.

Kast and Meltzer[1] affirm that their experiments have led them to hold a different opinion. They say that the abdominal organs of a dog examined through a small opening are undoubtedly sensitive. This sensitiveness can be demonstrated outside the abdomen if only a short loop of intestine is brought out and tested immediately. Inflammation greatly increases the sensitiveness. If all or a great part of the abdominal organs are exposed outside of the abdominal cavity their sensitiveness rapidly diminishes. Under such circumstances the sensitiveness of other parts of the body—for example the skin—is also reduced. In weak animals and by prolonged exposure of the intestines, this lessening of the sensitive reflex centres proceeds to the medulla oblongata, and the animal dies from shock.

The abdominal organs of cats and rabbits are provided with sensitive nerves, which rapidly loose their sensitiveness when the abdomen is opened. Until it is shown that sensation in man differs in its method from that of the warm-blooded animals, it must therefore be assumed the abdominal organs in man are supplied with a certain number of sensitive nerves, and that their activity is increased by inflammation.

This theory seems in accord with the frequent occurrence of all sorts of abdominal pain.

A Lack of Accurate Diagnosis in Abdominal Disease. Maurice Richardson,[2] in a paper read before the Kings County Medical Society, emphasizes the fact that an operating surgeon, except in case of emergency, should never perform an operation until by careful and painstaking study he has convinced himself of the wisdom of such procedure, no matter how thoroughly the diagnosis may have been made by other and possibly more learned men. The resort to the knife as the first step rather than the last makes, in his opinion, one of the most prolific of the evil tendencies of the times.

Another tendency which has done more than anything else to make

[1] Mitteil. a. d. Grenzgeb. d. Med. und Chir., 1909, vol. xix, p. 586.

[2] Boston Medical and Surgical Journal, 1908, vol. clix, p. 711

diagnosis slipshod and inaccurate is the tendency toward the operative diagnosis. Are we so poor in experience, and so inaccurate in deduction that we cannot make a diagnosis positive enough to ward from the unfortunate patient the additional misfortune of an unnecessary operation?

The successful application of the principles and methods of diagnosis in obscure medical and surgical cases is the result of keen mental processes accurately employed. An opinion logically deduced from history and physical examination is usually so reliable that the patient's life and health, as well as the surgeon's reputation, may be trusted to it. On the other hand, the accuracy of a non-operative diagnosis should always be severely questioned when the alternative diagnosis, or a strong possibility of that diagnosis, means abandonment of the patient to death and despair. Thus, the diagnosis of acute indigestion must be rigidly inquired into when the possibilities include acute appendicitis, perforated gastric ulcer, or gallstones. Nevertheless, the hurried resort to operative rather than bedside diagnosis hampers efforts at diagnosis, which would do away with many of the tragedies of modern surgery, even in the hands of the inexperienced. There is a "school," so to speak, of exploratory operators, and to this "school" flock many to whom the operative methods strongly appeal.

A third evil tendency is to make light of surgical operations. On this account, one should weigh the contrary indications in operation even more critically than the indications. An exploratory laparotomy in the comparatively well for trivial or local lesions has little risk. In patients reduced by serious and extensive disease it has grave dangers.

The remedy for these tendencies lies in thorough and persistent preparation for surgery: (1) By careful preparatory study; (2) by abundant clinical experience; (3) by the cultivation of a calm judicial temperament and the accurate weighing of evidence; (4) by the exercise on every possible occasion of "control" over diagnosis; (5) by the determination always to consider both sides of the question; and (6) by assiduous preparation for the mechanical and technical steps of operative procedure.

Disinfection of the Skin with Alcohol. Meissner[1] calls attention to the advantages of disinfecting the skin with alcohol. Numerous tests have convinced him that if the skin is bathed and shaved, and then rubbed for five minutes with sterile gauze saturated with absolute alcohol, its disinfection is accomplished more perfectly than by any other physical or chemical method. Dehydrated alcohol or wood alcohol may be employed in place of pure grain alcohol, in order to save expense. In order to be effective, it is essential that the alcohol employed be nearly or quite an absolute alcohol.

[1] Beiträge f. klin. Chir., 1908, vol. lviii, p. 198.

THE STOMACH.

Acute Dilatation of the Stomach. Acute obstruction of the duodenum following operation has been called attention to by several writers, some of whom have used the term "arteriomesenteric ileus;" but as this presupposes a theory, the accuracy of which is somewhat in doubt, the term acute dilatation is preferable. The dilatation of the stomach is the most marked symptom. This persists in spite of repeated vomiting, and in some cases in spite of lavage. In PROGRESSIVE MEDICINE for June, 1907, this subject was discussed, and illustrations from photographs were given. A recent case in which recovery followed a simple measure is reported by Rosenthal.[1] The attack came on three days after an abdominal hysterectomy, with much sharp pain around the umbilicus, followed by vomiting and gastric distention. Two days later, when the vomiting was occurring every five minutes, and the patient was apparently *in extremis*, she was turned on her face, and the vomiting ceased immediately. At the end of an hour she was held for a few minutes in a knee-chest position, in order to relieve the pain in the stomach, and then allowed to lie on her back. There was no return of the vomiting. This simple treatment was recommended by Schnitzler[2] many years ago.

Some operators have experienced this complication after laparotomy, have reopened the abdomen, and have generally failed to relieve their patient of the obstruction.

Lecene[3] reviews the cases which have been reported up to date, and thus groups the symptoms observed in them: (*a*) Vomiting and rapid collapse, which are essential characteristics of intestinal obstruction high up. The vomiting is incessant, profuse, bilious, green, but never fecal. Pancreatic ferment has frequently been demonstrated in it. (*b*) There is abdominal distention, most marked in the epigastric region, at least in the beginning. Peristaltic motion is usually not visible through the abdominal wall. (*c*) The intense thirst and scanty urine are easily explained, since the body is rapidly deprived of fluid. Anything swallowed is quickly vomited.

Gas and fecal matter may be passed from the rectum—a point which distinguishes this condition from other forms of acute intestinal obstruction. However, such passage does not always occur.

The conditions found at autopsy are always the same. The stomach is greatly dilated, and the duodenum equally so in proportion to its size, as far as the point where the mesenteric vessels crossed its horizontal portion. The rest of the small intestine is collapsed (Fig. 25).

[1] Archiv f. Gynecologie, 1908, vol. lxxxvi, p. 28.

[2] Wiener klinische Rundschau, 1895, vol. ix, p. 579.

[3] Journal de Chirurgie, 1908, vol. i, p. 781.

Various theories have been advanced to explain this peculiar condition, but only two are at present held by prominent writers. One group, which comprises Albrecht, Baumler, Kundrat, and Landau, states the case as follows: The mesentery is strongly drawn downward toward the pelvis by some cause, the duodenum is thereby compressed, its upper portion dilates, and following this there is dilatation of the stomach.

The other group of surgeons, comprising von Herff, Stieda, Borchardt, Leene, assert that there is first a postoperative paralysis of the stomach leading to acute dilatation, and that this dilatation crowds the small intestine into the pelvis, thereby making traction on the mesentery and obstructing the duodenum. If this view is correct, the acute obstruction of the duodenum can only result from a neglect to treat promptly post-

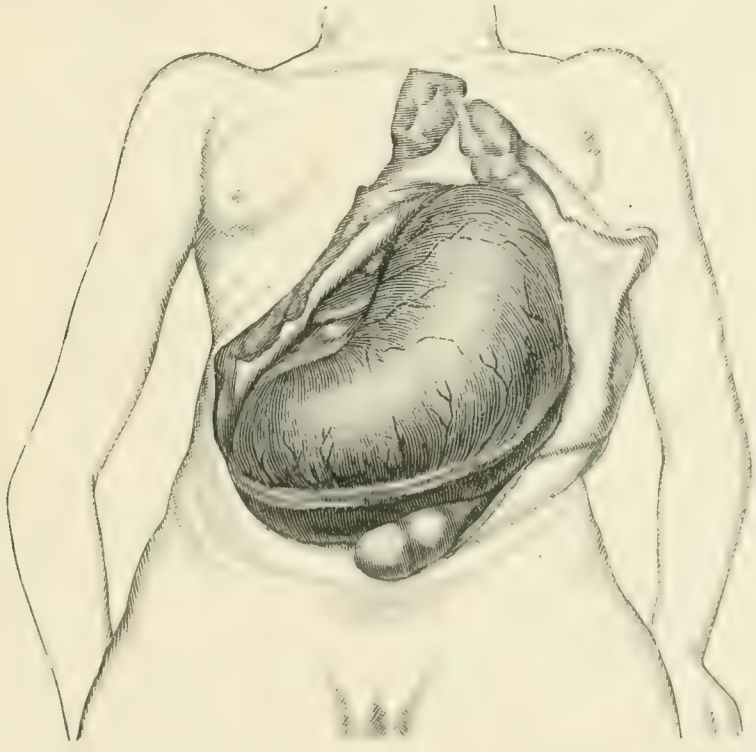

FIG. 25.—Postoperative acute dilatation of the stomach. (Borchardt.)

operative dilatation of the stomach. In some cases such dilatation of the stomach is probably due to the anesthetic; in others, it may be due to traumatism at operation or to a localized peritonitis

The first step in the treatment is gastric lavage. A reservoir with much fluid should be employed, and the tube used should be long enough to reach easily the bottom of the dilated stomach. When the fluid returns clear, a glass of broth or milk may be poured into it in order to stimulate a normal peristaltic action. When this treatment is practised soon after the beginning of the dilatation, it will almost always save the patients. In acute obstruction of the duodenum it may afford only temporary relief. In these cases it is necessary to combine it with ventral decubitus, or the knee-chest position. Others have achieved success by placing their patients in Trendelenburg's position, but the two last-named

positions can only be maintained with comfort for a few minutes. Camphor, caffeine, strychnine and other stimulants may be indicated.

Secondary operation, performed usually in the absence of correct diagnosis, has been followed by death in most cases. Some patients have recovered after gastro-enterostomy, but this is an illogical procedure, and should certainly not be employed until the simpler measures above outlined have been tried.

Very recently Kemp[1] has advanced a theory in regard to the cause of the acute dilatation, which differs from the second explanation given above. He claims that the obstruction to the duodenum is not due to the mesenteric vessels, but to the fibrous band which extends downward from the left crus of the diaphragm, and which serves to fix the duodenum in place. He places the chief emphasis, however, as has been done by others, on direct pressure upon the duodenum by the weight of the stomach. He made a series of experiments on four cadavers, and was able to demonstrate that the weight of a stomach distended with fluid is sufficient to close the duodenum, so that the fluid cannot escape, even when forced into the stomach at from five to ten pounds' pressure. In all of his experiments it did escape as soon as the stomach was lifted, and traction on the mesenteric vessels was not able to prevent it. Moreover, division of the root of the mesentery did not allow the fluid to escape if the stomach was not lifted, thus showing that the tension of the mesentery is not an important factor. In one case the fluid escaped when the fibrous band crossing the duodenum was divided, even though the stomach was not lifted. This is the first mention, so far as known, of the anatomical importance of this fibrous band in the production of the acute dilatation of the stomach and duodenum.

Diagnosis of Ulcer of the Stomach. Graham[2] mentions four prominent symptoms in the diagnosis of gastric and *duodenal* ulcers: (1) The periodicity of attacks; (2) the number of years through which the attacks and intermissions have run; (3) the characteristics of the pain; and (4) the disappearance of other symptoms when the pain is controlled. An attack often appears suddenly, and lasts for days or weeks, and frequently disappears as suddenly as it came. Most patients who come to operation give a history of such recurrent attacks and remissions extending over several years. Pain is the most significant single symptom. It varies in degree and location, but it is uniform in that it appears some time after meals, usually in from two to five hours.

A burning, gnawing feeling increases in intensity until vomiting or irrigation has removed the acid material which causes the pain, or until the acid is counteracted by the taking of fresh food. This relief, by taking another meal, becomes less marked as time goes on, until late in

[1] American Journal of Surgery, 1908, vol. xxii, p. 321.

[2] Journal of the American Medical Association, 1908, vol. li, p. 651.

the disease it may be altogether wanting. When pain is at its highest, so also is the formation of gas, eructation, and vomiting. If the acid is removed, neutralized, or engaged in the process of digesting fresh food, gas no longer forms, eructation and vomiting cease, and the patient enters a period of comfort for a few hours. When a patient presents the symptoms above outlined, he will usually be found to be suffering from ulcer of the stomach or duodenum. In a few cases purely functional hyperacidity, or appendicitis, or cholecystitis give symptoms that are very misleading.

Diagnosis of Perforating Ulcer. Although this is a subject that has been written upon frequently in the past ten or twelve years, it is well worth going over again occasionally, in order to see what are the salient points of diagnosis in the light of additional experience, for the diagnosis must be quickly made in this disease to be of any service to the patient.

Eliot[1] makes such a review, justifying it by the fact that in many localities the diagnosis is never made even now sufficiently early to permit successful operation.

The history may or may not show that the patient has suffered from previous gastric ulceration. The actual perforation is ushered in by an agonizing sharp pain. It may follow some exertion or wake the patient out of a sound sleep. If the perforation is near the cardia, the pain is referred to the left hypochondrium; if near the pylorus, it is referred to the epigastrium; and if in the duodenum, it is referred to the right hypochondrium. In the third group of cases a faulty diagnosis of appendicitis is often made. Pain is increased by motion, deep breathing, etc.

Vomiting due to peritoneal irritation occurs in about two-thirds of the cases at the outset. It may be absent until the development of the peritonitis. Hematemesis is rare. Shock is marked. There is usually the passage of at least gas per rectum.

Physical examination shows a shallow thoracic respiration. The epigastric region is at first retracted, but in a few hours it may be distended by the escaping gas. Abdominal rigidity is a constant and important symptom, and is present even during expiration when the patient is lying on the back with the knees flexed. The site of greatest muscular rigidity should be determined, for it is a reliable guide to the site of perforation. It varies according to the location of the ulcer, and corresponds fairly well to the site of the greatest pain as given above. As time elapses this nice localization of pain and rigidity disappears, owing to the development of secondary peritonitis. The point of maximum tenderness usually coincides with the point of greatest pain. If the peritonitis has extended to the pelvis, palpation through the rectum will show on which side it is situated by the reference of the pain to that side. Per-

[1] American Journal of Surgery, 1908-09, pp. 289 to 377; 22 to 25.

cussion may show the existence of dulness in the right flank in duodenal perforation, or in the left flank in case of perforation near the cardia. In many cases the amount of fluid escaping from the stomach is too small to give a definite area of dulness.

Absence of liver dulness due to escaping gas from the perforation in the stomach is a sign which must be classed as variable, and one which should never be allowed to determine the question of operation. The same may be said of the character of the pulse, which may be slow without change of tension, or rapid and weak if there is much shock. Operation should never be delayed on account of shock. There is usually a leukocytosis and an increase of the polymorphonuclear cells.

Later and more numerous statistics have only served to emphasize the inference drawn from the first collections of cases, that most of the patients operated upon in the first twelve hours after perforation recover and most of those operated on after twenty-four hours die.

The important steps in the operation as advocated by Eliot are: Emptying the stomach and duodenum by siphonage; closure of the perforation; examination of the posterior wall of the stomach for multiple perforations, often placed symmetrically if they exist at all; and closure of the abdominal incision, without drainage, if operation has been performed in the early hours, while most surgeons prefer drainage if there is well-developed peritonitis.

There has been considerable difference of opinion as to the performance of gastro-enterostomy in addition to the closure of the ulcer. Its advocates have claimed that it aids in the healing of the ulceration and prevents a possible recurrence. Against it may be said that the healing is quite good without it, and that it prolongs an emergency operation, and adds far more to the risk than does the very infrequent occurrence of a subsequent perforation. It should therefore not be performed unless the ulcer is so situated that its closure will unduly narrow the outlet of the stomach. If gastro-enterostomy is indicated for any other reason, it had better be performed at a later date, when the patient is better able to bear it.

Treatment of Ulcer of Stomach and Duodenum. The treatment of ulcer of the stomach was made the chief subject of discussion at the last French Congress of Medicine. Most of what was said had to do with medical treatment, but it seemed to be more than ever recognized that surgical treatment has its place, not only for certain complications of ulceration, such as stenosis or carcinoma, but more intelligently at certain stages of the ulcer. The general opinion might be summarized as follows, a summary[1] which is equally valuable for surgeon and internist. Surgical treatment is never more than one step in the cure of ulcer.

[1] Millon, Archives des maladies de l'appareil digestif et de la nutrition, 1908, vol. ii, p. 32.

Operation puts the patient in the way of repair, but does not cure him, and the complete disappearance of symptoms after gastro-enterostomy should not lead to the overlooking of this important fact. After operation, medical treatment should be continued as strictly as before. The operation gives a better chance to produce favorable results. Both surgeons and physicians admit that a large number of failures from operations are due to neglect of this rule. Furthermore, the patient should be advised that the immediate improvement following an operation does not warrant his return to bad habits of eating and drinking. Ulcer of the stomach is a curable but a serious disease, demanding for its cure a very long period of treatment.

While the general technique of gastric surgery can be better learned in a few weeks at the operating table of any one of the masters of this subject in this country and abroad than by any amount of reading, there are certain principles which must be observed by anyone who wishes to obtain good results. The most important of these, as given by Ochsner,[1] are:

1. The amount of traumatism must be reduced to a minimum.
2. The intra-abdominal organs must be exposed as little as possible to cold air or cool pads.
3. The patient must be placed in a sitting posture as soon as possible after the operation.
4. In case of closure of perforation the direction of the wound must be chosen so as not to result in obstruction later as a result of cicatricial contraction.
5. In case of excision of a neoplasm, all the tissue closely connected by lymphatics must be removed with the growth.
6. In gastro-enterostomy the lowest portion of the stomach must be chosen, no matter whether anterior or posterior gastro-enterostomy be performed—the latter, however, being preferable.
7. There must be no tension upon sutures in gastric operations.
8. Except in complete gastrectomy the coronary artery must always be preserved.
9. In patients with an unusually fat transverse mesocolon, in whom posterior gastro-enterostomy is performed, the opening should be torn very large and the edges should be sutured to the stomach in order to prevent obstruction.
10. In case of acute gastric dilatation following any stomach operation, a stomach tube should at once be introduced and gastric lavage should be employed, care being taken not to introduce more than one-fourth liter of water at a time.
11. The simplest possible technique should be employed, preferably without the use of mechanical apparatus.

[1] New York State Journal of Medicine, 1908, vol. viii, p. 172.

12. These patients should be controlled for a long period of time after the operation regarding their diet and general hygiene.

Results after Operation for Ulcer. The frequency of *duodenal ulcer* has been more and more emphasized, and many cases previously considered to be pyloric ulcer are now known to be strictly cases of duodenal ulcer. Mayo,[1] in reviewing the progress of surgical treatment of chronic gastric and duodenal ulcers, says that the duodenal ulcer is the lesion in nearly two-thirds of the patients he sees. If an ulcer is not actually demonstrated, no gastric operation is undertaken unless necessitated by hemorrhage. Gastrojejunostomy is performed for a duodenal ulcer; Finney's gastroduodenostomy for pyloric stricture. Ulcers in the stomach at a distance from the pylorus are excised. If hour-glass contraction is present, the whole diseased area is excised, or proximal gastrojejunostomy is performed. If there is a calloused ulcer of the pyloric end of the stomach, a partial gastrectomy is performed, the upper end of the duodenum is closed, and posterior gastrojejunostomy is independently performed. Mayo has been able to trace 234 patients operated upon more than two years ago for an actually demonstrated ulcer. Of these, 189 (or 81 per cent.) are cured; 21 (or 9 per cent.) improved; 10 (or 4 per cent.) unimproved; while 14 (or 6 per cent.) have died since the operation from various causes.

Moynihan[2] is able to report the results, after a period of two years or more following operation, in 205 patients for chronic gastric or duodenal ulcers, or both combined. In nearly all of these patients there was a demonstrable ulcer at operation. He summarizes the facts ascertained as follows: Cured, 148; relieved, 5; doubtful, 9; no better, 12; no recent report 14, of whom 11 may be considered certainly as cured. Died as result of operation, 2; carcinoma of the stomach, 7; of other causes, 8.

The lessons to be learned from this large experience of Moynihan are:

1. The operative treatment of stomach disorders should be confined exclusively to those cases in which an organic lesion is present. If one makes a diagnostic mistake, and displays upon the operating table a perfectly healthy stomach, gastro-enterostomy should not be performed.

2. In cases of acute perforation, the perforation should be closed or the ulcer excised. If the ulcer is prepyloric, pyloric, or duodenal, gastro-enterostomy should also be performed.

3. If an ulcer is situated upon the lesser curvature, it should be excised to forestall the development of malignant disease.

4. If an ulcer is prepyloric, pyloric, or duodenal, gastro-enterostomy should be performed. When possible, the ulcer should be infolded, since hemorrhage and perforation have occurred from ulcers months or even years after the performance of gastro-enterostomy.

[1] Transactions of the American Surgical Association, 1908, p. 142.

[2] Ibid., p. 129

5. The most satisfactory method of gastro-enterostomy is the posterior, no-loop operation, with an almost vertical application of the bowel to the stomach.

6. Regurgitant vomiting occurs as a result of the loop operation, whether anterior or posterior. It is almost certainly relieved by entero-anastomosis. In slighter cases the vomiting of bile may be relieved by lavage continued for some weeks.

Deaver[1] has been able to trace 66 patients upon whom he has performed operations for benign disease of the stomach and duodenum: 44 are well, 9 are greatly improved, 5 are unimproved, and 8 have died. In his judgment all cases of stenosis of the pylorus, whether due to a neoplasm, cicatricial contraction, hyperplasia, pylorospasm, or what not, should be treated by operative interference, preferably by gastrojejunostomy. All cases of ulcer of the stomach and duodenum which do not respond promptly to medical treatment should be treated by operation. His preference in performing gastro-enterostomy is by the posterior gastrojejunostomy, no-loop clamp method.

Chronic Ulcer and Cancer. The difficulties of diagnosis between chronic ulcer and cancer of the stomach have been mentioned by many writers. Many ulcers have been excised under the supposition that they were malignant, while others have been allowed to remain under the supposition that they were benign, and have subsequently proved themselves carcinomatous. The difficulty of distinguishing between the two has been given as a reason for excising all chronic ulcers through fear of present malignancy. Lund[2] recommends excision in the case of all indurated ulcers which are movable and free. They are usually of the lesser curvature. Indurated ulcers of the pylorus often start in the duodenum, and become adherent to the pancreas or left lobe of the liver. Such ulcers are usually benign, and, in view of the fact that excision is difficult he gives the preference to gastro-enterostomy rather than excision.

Mayo says that the surgeon has been asking too much of the practitioner in requesting him to turn cases of gastric cancer over for operation early. As a rule, the diagnosis cannot be made sufficiently early. Hence, the practitioner should be asked to turn over to the surgeon cases of pyloric obstruction without waiting to determine by a chemical analysis whether a tumor or cancer exists. Tests to determine this point are too uncertain to be relied upon, while medicine cannot permanently relieve mechanical obstruction.

Rodman[3] emphasizes the fact that the development of a carcinoma in a gastric ulcer occurs with far greater frequency than most physicians realize. This being a fact, there should be an early resort to exploratory

[1] Transactions of the American Surgical Association, 1908, p. 160.
[2] Journal of the American Medical Association, 1908, vol. li, p. 558.
[3] Transactions of the American Surgical Association, 1908, p. 189.

laparotomy in all gastric cases of doubtful nature failing to yield to medical treatment within a reasonable time.

Operations for Cancer of the Stomach. Delageniere[1] reports ten cases of gastrectomy total and subtotal for cancer, the upper stump of the stomach being sutured into the jejunum after the manner of a posterior gastro-enterostomy. There were four deaths from operation, a mortality of 40 per cent. Boeckel, who made a search of the literature, found records of 46 cases, with 28 recoveries, a mortality of 39 per cent. Instances have been known in which patients have survived the removal of the major portion of the stomach for eleven years. The longest period of survival in the cases here reported was three and one-half years, although one patient was still living at the time of report, two years after operation.

Faysse[2] believes that *cancer of the pylorus* is favorably situated for a wide incision. It remains movable for a long time, thanks to its meson. Moreover, it early attracts the attention of the patient and his physician, because, developing in the lumen, it gives rise to stenosis and the resulting symptoms. A fairly early diagnosis ought therefore to be made, and at an early stage pylorectomy is a safe operation, and is, moreover, strongly to be recommended because its late results are so good.

The series of *pylorectomies* which Faysse reports were performed between 1899 and 1904. Three patients died from the operation, 5 survived for periods ranging from seven months to five years, and 5 were living at the time of report, at periods ranging from two and one-half to six years. In 3 of these cases it is fair to state that no epithelioma was found in the ulceration and stenosis.

In the operation here described, posterior gastro-enterostomy was first done, and then the pyloric tumor was resected. This plan of procedure gives the surgeon a freedom in excising the tumor that he might not feel if he had to perform a subsequent gastro-enterostomy.

In speaking of the outlook for pylorectomy in cancer, Czerny[3] says that a lower mortality follows the attempts to protect the operative field from the escape of gastric contents during the operation; from better methods of suture, which shorten the operation; and from improved narcosis, with a combination of morphine, hyoscine, and chloroform, by which the dangers of pneumonia are lessened. Better late results are to be obtained by confining the operation to those cases in which the general strength of the patient and a relatively high percentage of hemoglobin warrant a serious operation. It is then possible to resect the stomach a distance of some centimeters beyond the disease, especially on its cardiac side, where the lymphatic circulation is active. Progress in treatment of cancer of the stomach does not rest upon the knife alone, but rather upon

[1] Annales Internationales de Chirurgie Gastro Intestinale, 1908, vol. ii, p. 61.
[2] Ibid., p. 20.
[3] Ibid., p. 201.

an improved diagnosis, the biological study of different forms of cancer, and research into the etiology of cancer of the stomach.

THE SMALL INTESTINE.

Flushing the Intestinal Canal. Monks[1] has continued his experiments in order to find the simplest and safest method of quickly removing the contents of the small intestine, since such an operation seems desirable when there is peritonitis accompanied by intestinal toxemia. He finds that the human intestine may be emptied through an abdominal incision from the ensiform cartilage to the pubes, while its lower half, together with the large intestine, can usually be emptied through a median incision below the umbilicus. His plan is to take up the highest loop of small intestine which is accessible, to determine its upper and lower ends by palpation of its mesentery, in order to make sure that it is not twisted; to insert a large glass tube through a small opening in the intestine, and to wash its contents downward, allowing them to escape through a second glass tube inserted some feet below. When the water comes away clear, the upper tube is withdrawn and the opening sutured. The second tube is then reversed in direction, and another section of bowel is washed out through a third opening. Fig. 26 serves to make this clear. When the intestine has been emptied, all wounds in it are sutured.

Monks has successfully employed his plan of treatment in the case of a little girl, aged eight years, suffering from an extensive streptococcus peritonitis with toxemia. During the operation the pulse fell from 180 to 140, and the patient made a good recovery.

Intestinal Anastomosis. "Intestinal Anastomosis without Open Incisions by Means of Basting Stitches" is the title of an article by Parker and Kerr.[2] Although each year a number of new methods of intestinal anastomosis are suggested, these writers feel that they are justified in adding one more to the list, since their method possesses certain advantages favoring rapidity of operation and a minimum soiling of the wound. The intestine to be resected is clamped obliquely and divided between the clamps (Fig. 27). An over-and-over-continuous suture is then placed over each clamp (Fig. 28). The clamp is withdrawn and the suture drawn taut (Fig. 29). By means of these "basting" stitches the two ends of the intestine are held in approximation, and a continuous Lembert suture is inserted (Fig. 30). When it is complete all the way around, the "basting threads" are cut short at one end and withdrawn. This opens the lumen of the intestine. This method of technique offers a very great advantage in requiring no special instruments and only a single assistant. They have tested this method in a number of experi-

[1] Transactions of the American Surgical Association, 1908, p. 456.

[2] Johns Hopkins Hospital Bulletin, 1908, p. 132.

ments upon dogs, and have found it to work exactly as planned; and I am informed by them that since the publication of this article they have employed it with entire success upon the human subject.

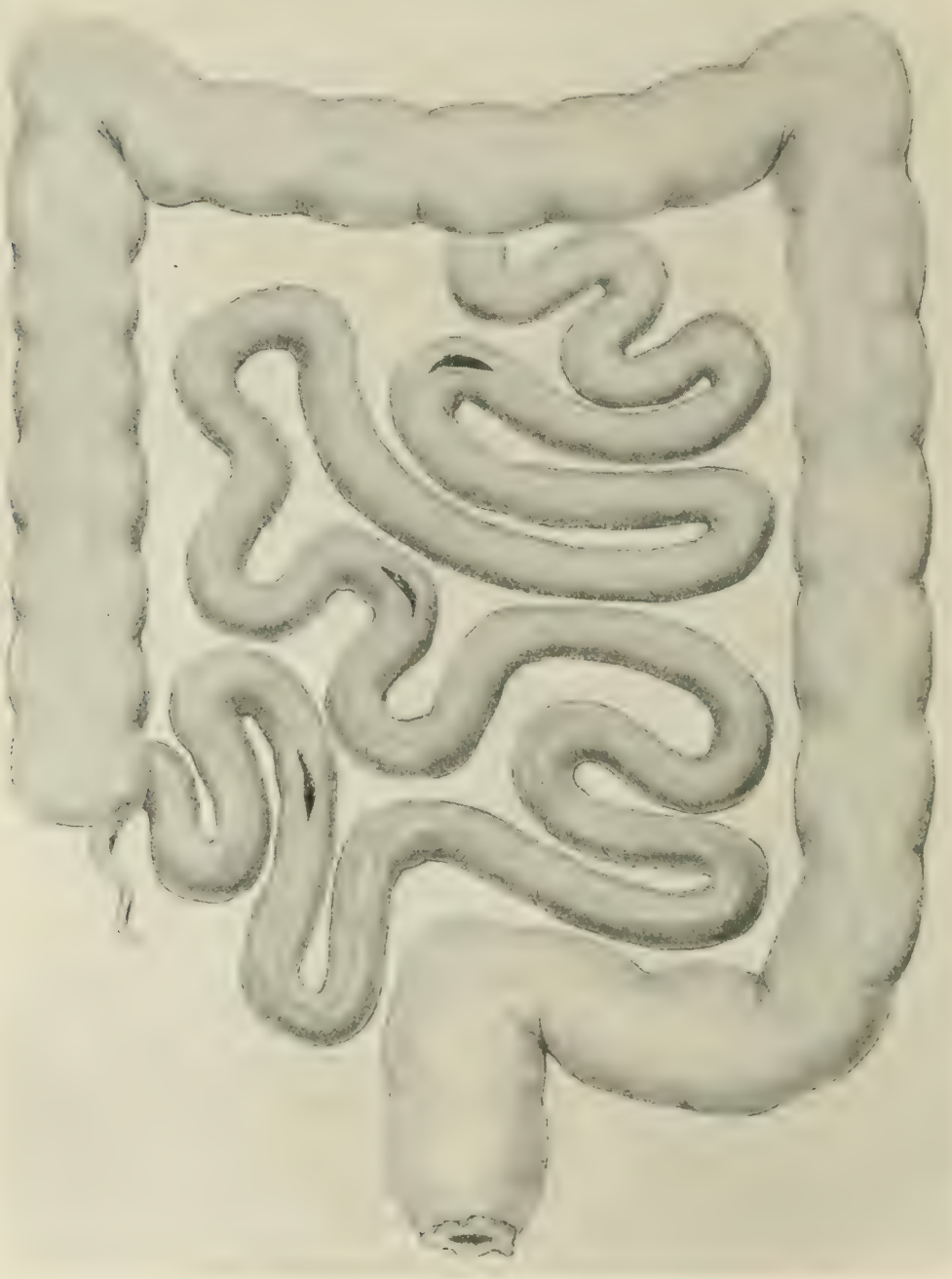

FIG. 26.—A diagram to illustrate a method by which the intestinal canal may be flushed. The number and position of the enterotomy wounds would naturally vary with the case. (Monks.)

Walker[1] advocates a method of intestinal anastomosis, the chief advantage of which is that it can be carried out by one pair of hands, with scissors, needle, and thread; and that it affords a relatively accurate

[1] Journal of the American Medical Association, 1908, vol. li, p. 546.

Fig. 27

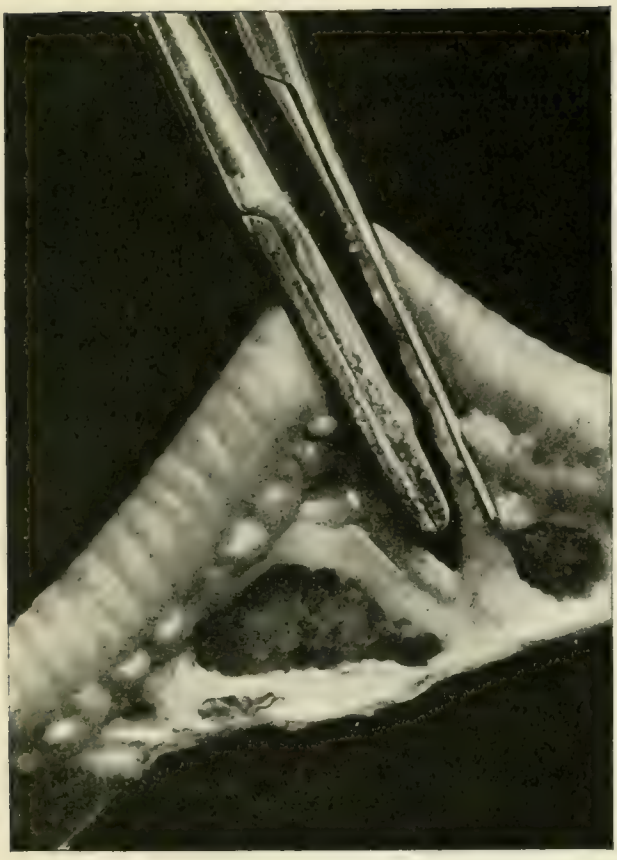

Fig. 28

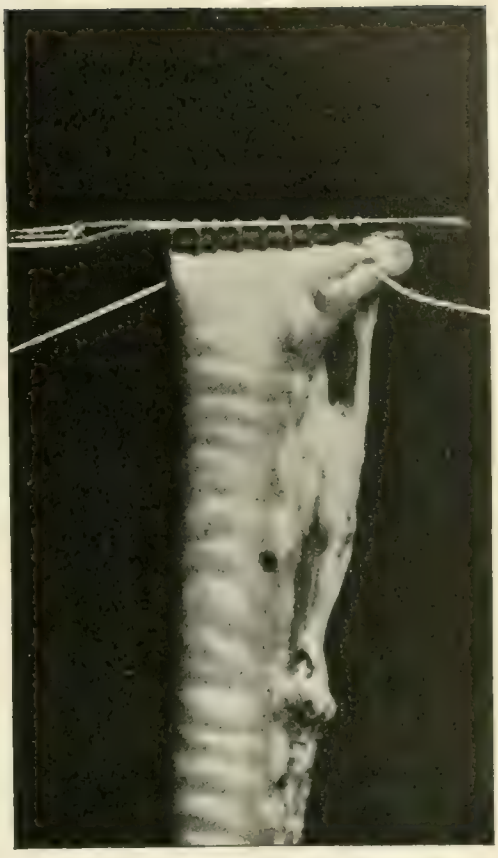

Fig. 29

Fig. 30

Fig. 27.—The intestine has been clamped and divided.

Fig. 28.—A "basting" stitch is placed in position over each clamp.

Fig. 29.—The clamp is withdrawn and the "basting" stitch is drawn taut. The photograph shows it in the process.

Fig. 30.—The "basting" stitches have been drawn taut and the permanent suture of intestine is begun. When this is complete, the "basting" threads are cut short and withdrawn, thus opening the lumen of the intestine. (Parker and Kerr.)

protection from infection. It is based on the closure of the openings into the intestine by means of a purse-string suture, which is removable after the permanent suture has been completed.

The accompanying illustrations require only a brief explanation: In end-to-end anastomosis (Fig. 31) two ligatures (*LL*) are placed on the healthy bowel on either side of the portion to be resected. Two purse-string sutures (*PS*) are inserted about a half-inch away from the ligatures and tied in a slip knot (*K*). The mesenteric vessels are then ligated and the mesentery and intestine cut, as on the dotted line.

FIG. 31.—*L*, ligature; *PS*, purse-string suture; *K*, slip knot. The left side of the figure represents purse-string suture and ligature placed and ready for tying; the right side represents them tied and the gut cut across. In the upper right corner the slip knot is represented on a large scale. (Walker).

Fig. 32 shows the intestinal ends approximated and held in place by two mattress stitches (*GG*).

Fig. 33 shows a continuous mattress suture which may be begun at any point except the mesenteric attachment. The gap in the mesentery is closed by interrupted stitches. After the continuous mattress suture is drawn taut and tied, the purse-string sutures are withdrawn by pulling gently on their loose ends.

This method of technique may be followed in the performance of a lateral anastomosis.

Perhaps no one in the country is better qualified than Connell[1] to judge the merits of any method of intestinal anastomosis. He says that

[1] Journal of the American Medical Association, 1908, vol. li, p. 548.

the methods of Parker and Kerr and that of Walker are similar in principle to that of Parlavecchio, which was published in 1897. A

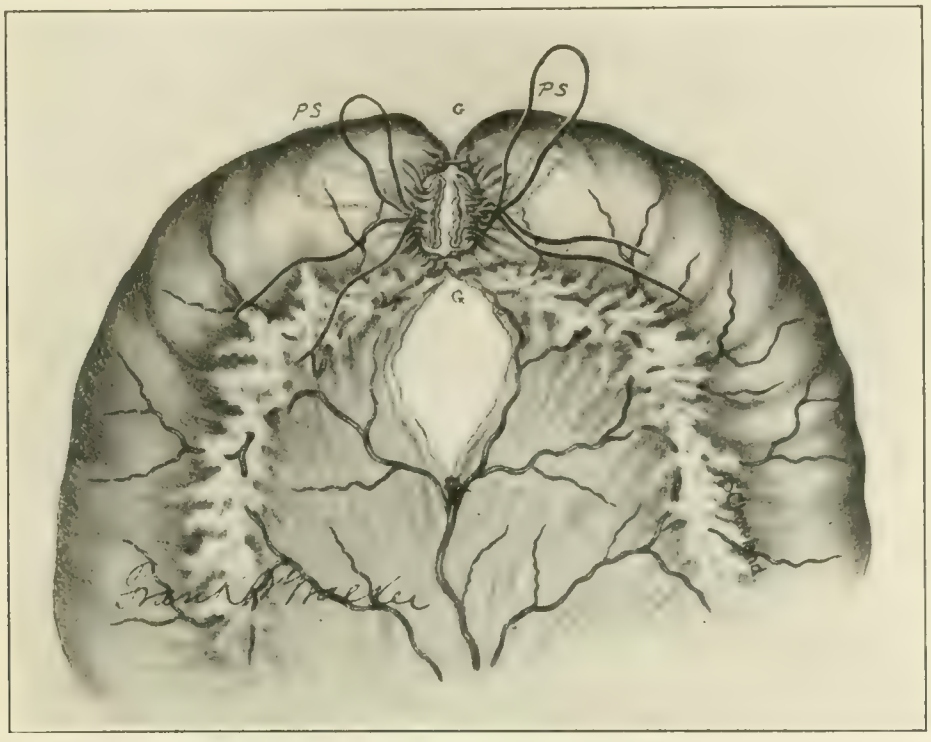

FIG. 32.—The stumps closed by purse-string sutures (*PS*) tied with slip knots and held together by two guy mattress sutures (*G*). (Walker.)

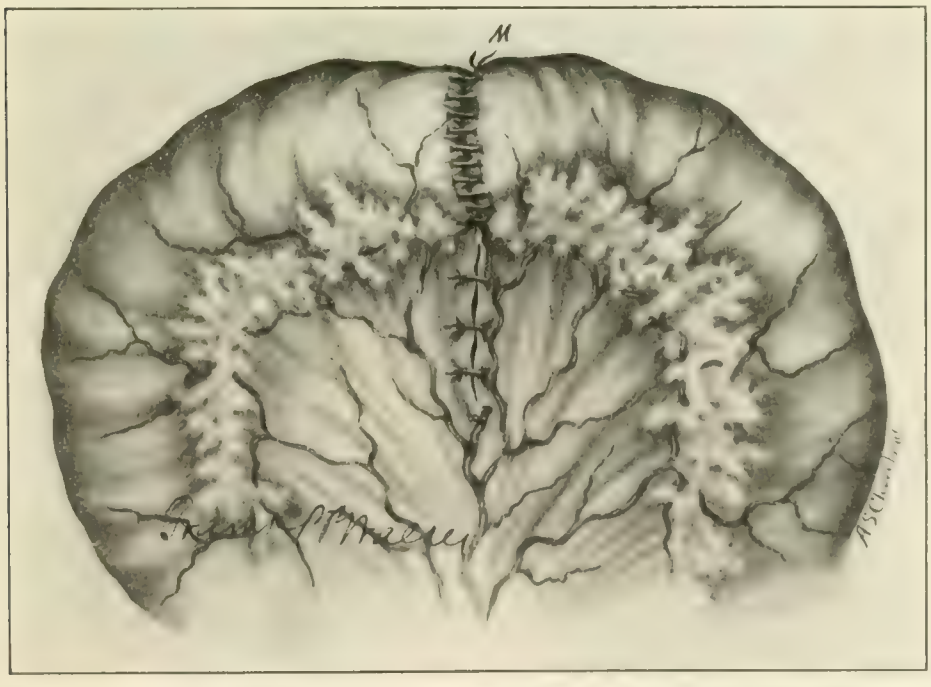

FIG. 33.—This represents the continuous mattress suture (*M*) placed but not drawn taut. The purse-string sutures have been withdrawn. The mesenteric gap has been closed by three sutures. (Walker.)

prime requirement of any intestinal suture is that it shall be secure, holding the cut ends in seroserous apposition, or apposition continuously around the entire line of union, to secure which caution must be exercised

at the mesenteric junction, because of the triangular space between serosa and muscularis formed by the anatomical arrangement of the peritoneum, which allows a longitudinal strip of the intestine at this point to be devoid of serosa. The perforating or through-and-through suture has been generally adopted as the important security giving stitch. The use of a second row of stitches, including only the serosa and the muscularis, is at present looked on as merely a precautionary measure, for the purpose of causing a broader seroserous apposition, and not to resist tension.

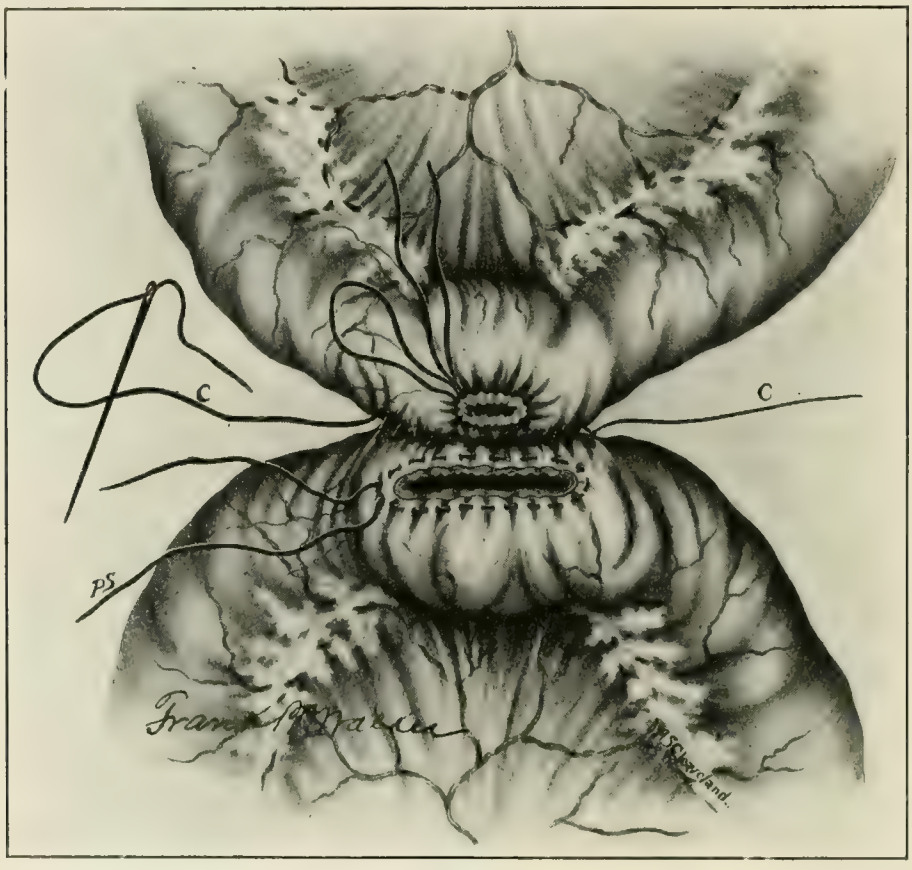

Fig 34.

Any stitch that enters the bowel lumen or comes into contact with the intestinal mucosa should be of non-absorbable material. This will remain in place until its usefulness is past, after which it will be eliminated into the intestinal current. Catgut, on the other hand, may be absorbed too rapidly. The secondary reinforcing seromuscular stitch does not communicate with the lumen, and, therefore, may be of catgut. The time-saving feature and the hemostatic properties are perhaps the most important reasons why the continuous suture is employed more often than is the interrupted.

Invagination in Place of Resection of the Intestine. In dealing with *gangrenous intestine*, the two well-recognized methods of procedure are resection with suture and the establishment of an artificial anus. The

tendency has been more and more toward the former procedure, since if it succeeds the patient is saved the necessity of a subsequent operation. Summers[1] suggests a third possible method of treatment in cases of limited annular gangrene of the small intestine, such as is seen in many cases of strangulated hernia. This consists in invagination of the gangrenous portion downward into the healthy portion. It is accomplished by the passage of four mattress sutures inserted above and below the gangrenous portion. By tension upon these, combined with manipulation, the invagination is accomplished.

This technique is recommended by Summers only in cases in which less than two inches of bowel are affected, since it would be difficult to invaginate a greater amount without producing undue traction upon the mesentery. He reports three successful cases, two of them of strangulated hernia and one of a ragged intestinal gunshot wound. In the discussion of this paper it appeared that this technique has already been employed in this country by Lund, McArthur, Bevan, and others, and in France by Guinard.

Gas Cysts of the Intestine. Finney[2] operated upon a man, aged sixty years, for carcinoma of the stomach, performing a gastro-enterostomy. There was discovered at the operation a soft, multilocular, cystic tumor, six inches long and about three inches wide, attached to the free border of the ileum about one foot above the ileocecal valve. It was made up of a great number of small cysts containing gas, the largest being about the size of a grape. When pricked, the gas, or air, escaped with an audible hiss or pop. The mass of cysts completely surrounded the intestine, and extended a short distance upon both sides of the mesentery. Finney made an extensive search through the literature, and was unable to find the report of a single similar case in America. A number of such cases have been reported in Europe, where the general opinion seems to be that the gaseous tumor is due to the action of some bacillus. The growth of these tumors is slow. They give rise to few or no symptoms, and have been discovered accidentally at operation or autopsy.

THE APPENDIX.

Appendicitis. The number of articles published upon appendicitis continues large in spite of all that has been written upon it and the very general agreement upon most of the points in connection with it. When one considers, however, that operations for appendicitis are the largest single item among the list of major operations in most hospitals having a general active surgical service, and that they form one-fourth or more of

[1] Journal of the American Medical Association, 1908, vol. li, p. 172.
[2] Ibid., p. 1291.

all laparotomies, it is not to be wondered at that the subject retains its interest. Many of the writers have little that is new to present, but they doubtless serve a useful purpose in aiding their readers to make a correct and prompt diagnosis, upon which in this disease, as in most others of the abdominal organs, good surgical work depends.

The Cecal Distention Test for Appendicitis. Chase[1] mentions a test for use in suspected or real appendicitis which he calls the cecal distention test. It is performed as follows: The patient lies on his back, with his knees flexed and his shoulders raised. The surgeon stands on the patient's left, facing the feet. The fingers of the left hand are deeply pressed into the patient's left inguinal region, and are slowly drawn upward over the course of the colon and fixed under the margin of the ribs. The right hand is used to reinforce the left one in making this manipulation. While the left hand is still in place the right one is lifted, and with it sudden pressure is made over the transverse colon. A gaseous compression wave will travel across the transverse and down the ascending colon, producing cecal distention and a typical sharp pain in the right iliac fossa if inflammation of the cecum or appendix is present.

Chase has proved the accuracy of this test in a number of cases. Its absence is no less significant. When he has operated for appendicitis in the absence of this distention test, he has either failed to relieve the patient of the typical pains or has found other conditions which explained the suffering: in one case, right sacro-iliac tuberculosis; in another, a duodenal ulcer; and in a third, a small intraligamentous cyst of the right broad ligament. An account of this test had already been published by Rovsing, of Copenhagen, but without the knowledge of Chase.

Rovsing,[2] after more than one hundred observations, formed the following conclusions in regard to the cecal distention test: It has considerable value in differential diagnosis in many cases of acute as well as chronic appendicitis, with tumefaction and pain in the right iliac fossa of uncertain origin. In such a case the diagnosis might lie between a renal affection, a calculus, or affection of the ureter, salpingitis, etc. It is only in the cases in which the cecum and appendix are involved that pressure on the healthy descending colon gives this sign: In acute cases in which direct palpation is dangerous, impossible, or too painful, palpation of the descending colon produces immediately, and without any risk in cases of appendicitis, typical pain at McBurney's point.

Lauenstein[3] reports a case in which he obtained Rovsing's sign, and made a diagnosis of appendicitis. At operation he found an acute cholecystitis, the appendix being healthy. The enlarged gall-bladder was in contact with the colon and adherent to the omentum. He concludes that the sign may be present in any case of inflammation around the colon.

[1] Journal of the American Medical Association, 1908, vol. l, p. 610.

[2] Centralblatt f. Chirurgie, 1907, p. 1257.

[3] Ibid., 1908, p. 233.

Hoffmann[1] tested the sign in 34 patients, 18 of whom were suffering from perityphlitis. In these 18 cases Rovsing's sign was present 3 times, and in 2 of those there was exudate in the free peritoneal cavity. McBurney's sign was present 14 times. In 13 cases of inflammation not of the appendix, Rovsing's sign was found 3 times, McBurney's once. Hoffmann concludes that Rovsing's sign fails except when the peritoneum is inflamed.

In reply to this criticism, Rovsing[2] says that Hoffmann failed because he did not apply the test correctly. He made a sudden pressure at a distance from the descending colon. The proper method is described above. The whole point in the test is that the ultimate pressure shall be made upon the colon alone. Applying the test in this manner, Rovsing has never found it to fail in cases of inflammation within the appendix, and in some of these McBurney's sign did fail. The test is uncertain in cases of perforation into the peritoneal cavity, or in cases of appendicitis associated with peritonitis and meteorism.

Tenderness in the right lumbar ganglion alone Morris[3] attributes to appendicular trouble. Tenderness in both of the lumbar ganglia means irritation in some structure situated in the pelvis. This tenderness is elicited by pressure one inch and a half from the umbilicus on a line running toward the anterior superior iliac spine.

Traumatism and Appendicitis. There can be no doubt that traumatism plays some part in the development and outcome of appendicitis. If an organ acutely inflamed is crushed or torn by a blow, or an appendicular abscess is ruptured by a similar accident, the direct effect of the trauma is so evident that no one can dispute it; so that the real question is as to the part traumatism may play in producing acute or chronic appendicitis in those who are not at the time suffering from appendicitis, and in those who have previously had no symptoms referred to the appendix. This opens a wide field for discussion. In certain cases the effects are so sudden and continuous that they cannot be easily laid aside. Thus, in my own experience, a healthy girl of sixteen was so full of animal spirits that she left the dinner table, danced around in an adjoining room, and finished her frolic by trying to kick the chandelier. In less than forty-eight hours a perforated gangrenous appendix was removed. Here is the extreme result from what is apparently the slightest form of injury—sudden muscular contraction. Many similar cases have been reported. Blows upon the abdomen may act by crushing the appendix against the hard posterior bony wall of the abdomen or pelvic brim; or possibly by dragging on the organ and so tearing it, but not necessarily through all of its coats. Some writers have averred that in these direct traumatic cases there is an unusually high percentage of

[1] Centralblatt f. Chirurgie, 1907, p. 533.

[2] Ibid., p. 537.

[3] Journal of the American Medical Association, 1908, vol. l, p. 278.

fecal concretions present. Within the past year Bruning[1] has made an exhaustive study of this whole subject, reviewing no less than seventy-four articles, American, English, French, and German. The overwhelming opinion seems to be that traumatism may produce appendicitis in an organ that has not previously given trouble; but that to be held responsible in any case, the traumatism should be followed immediately and more or less continuously by symptoms of appendicitis. It is obvious that an appendix which has been altered by previous inflammation will be even more likely than a healthy appendix to suffer inflammation following a traumatism. But this is no reason to excuse the traumatism from its causative role if the other conditions mentioned above are fulfilled. In medicolegal work these positions are theoretically sound, and are defensible by a great number of cases, as well as by the opinions of most of those who have written upon this subject.

Warbasse[2] explains the relation of traumatism to appendicitis as follows: The causes usually assigned to the origin of appendicitis are most of them traumatic in nature. Some change is produced which permits a microbic invasion of the wall of the appendix. The mucous membrane may be abraded by foreign matter, or its vitality may be lowered by a pressure of retained secretion; or the follicles may be distended by bacterial product; or angulation may produce a local pressure; or a distended cecum may prevent the appendix from emptying its excess of ptomains. These are all forms of slight traumatism, produced from within. If they can result from internal pressure, it is obvious that they can be produced from an external pressure, to which the situation of the appendix renders it especially liable. He therefore holds that appendicitis occurring in a person whose appendix had given no previous symptom may be due to traumatism.

Intraperitoneal Changes in Appendicitis. Stanton[3] has studied more than a thousand cases of appendicitis in order to determine the course of the intraperitoneal changes in this disease. He found that cases of appendicular peritonitis can be divided into two sharply defined groups: (1) Those in which the intraperitoneal exudate is fibrinous and therefore dry, and (2) those in which the exudate is serous or seropurulent, and therefore fluid. In the first class of cases organization of the fibrinous exudate may be noticed as early as the third day, and is well advanced by the fourth or fifth day. The exudate is promptly absorbed, and the resulting adhesions are probably not permanent. This fibrinous peritonitis may exist outside of an appendicular abscess.

In the second class of cases, marked by a fluid exudate almost from the beginning, the development of a diffuse peritonitis often occurs

[1] Archiv f. klinische Chirurgie, 1908, vol. lxxxvi, p. 907.

[2] New York State Journal of Medicine, 1908, vol. viii, p. 411.

[3] Surgery, Gynecology, and Obstetrics, 1908, vol. vi, p. 397.

with alarming rapidity. In cases operated upon the first day few or no limiting adhesions were found. The bloodvessels of the peritoneum were more or less congested. In operations performed during the second day the quantity of seropurulent or purulent exudate was much increased. The absence of well-defined limiting adhesions was still noticeable. In cases operated on during the third day gross changes in the peritoneum were noticeable, due in part to more abundant fibrin and in part to commencing organization. Limiting adhesions were fairly well formed; pus was found extending irregularly between the various organs in the involved territory. By the fourth or fifth day organization by granulation was well established, enclosing the pus in definite abscess cavities. Although these limiting adhesions were easily broken down for another two or three days, by the tenth day adhesions were very firm and of a highly vascular type, and about this time, or a little later, abscesses began to rupture into the intestine or elsewhere.

As a result of this study, Stanton affirms that the clinical division of appendicitis into three stages with a widely differing operative mortality rests on a firm pathological basis. During the first stage the peritoneal lesions, if they exist at all, are of such a type as to require only temporary drainage, or none at all. During the second stage, after the full development of the peritoneal infection, and before it results in a well-defined abscess, removal of the appendix is by no means curative of the peritonitis, while efficient drainage is often difficult or even impossible. This period extends from about the second or third day until the eighth or ninth. The third period begins after the eighth or ninth day. By this time the abscess has definite walls, and its drainage is a simple and satisfactory procedure. In the mild cases in which no abscess forms the patient recovers without passing through this third stage.

Stanton says that the high operative mortality of the second stage should be avoided by carrying the patient over it by following the plan of treatment outlined by Ochsner. In the absence of peristaltic movements, such as are produced by food given by mouth, or by cathartics, the tendency of a localized peritonitis, even of appendicular origin, to spread beyond its original boundaries is very slight indeed. In a number of cases in which food and cathartics had been given by mouth, the clinical history showed that such action was followed by an acute exacerbation of the symptoms due to an extension of the peritonitic inflammation.

This question has been fought over many times, and mention of it has been made in previous numbers of Progressive Medicine. I can only reaffirm here that the conclusions of Stanton do not commend themselves to most surgeons. Whenever there is a perforation in the alimentary canal, whether in the appendix or elsewhere, it should be closed as soon as possible. If this cannot be done, drainage as direct as possible should be established. These measures are the best protection to the rest of the peritoneal cavity, and Ochsner's plan of treatment ought

never to be considered as a substitute for a properly performed operation, in cases in which it is possible to give the patient the benefit of the latter. For the latest views on the treatment of peritonitis the reader is referred to the earlier pages of this article under the heading Abdomen in General.

Appendicitis in Children. Acute appendicitis in children is commoner than is generally supposed. Vincent[1] found that more than 60 per cent. of all the laparotomies performed at the children's hospital in Boston during a period of four years were performed for appendicitis. The most recent one hundred cases were chosen for study, the age of the patients ranging from two to twelve years. Fifty-two were in boys and forty-eight in girls.

Appendicitis in a child over ten years of age is practically the same as in an adult. Under ten years of age, the disease presents certain characteristics due to the child's lack of mental and physical development. In a young child the rapidity of the inflammation is more marked, so that at operation a non-perforated appendix, distended with mucus or pus, is rarely seen. There is often a lack of an accurate history in the case of a child, and the physician is further hampered by the inability of the child to describe accurately the existing symptoms.

The child should be examined fully undressed, and in bed. When possible, the pulse should be counted during sleep. The first part of the examination should be the palpation of the abdomen, as this is most essential, and should not be postponed until the child has become restless or frightened. It should be followed by a digital rectal examination, which produces no injury even to an infant. A surprising extent of the abdominal cavity of a young child can be reached by the finger in this way. Rigidity and local tenderness are positive signs, but they may be so light in character as to be overlooked. The abdominal walls of a child are thin, and a mass is easily palpated. If the child cries and struggles, right-sided rigidity may be apparent during deep inspiration, even though it is obscured at other times. One should never be misled by the apparent health and unconcern of the patient. A child may sit up in bed without visible discomfort, although its appendix is badly inflamed.

The operation upon a child is easier than upon an adult, by reason of the thin abdominal wall and the short distance to the back of the abdomen. On the other hand, the delicacy of all structures and the inability of the child to withstand a long operation compel the surgeon to move quickly though carefully. Different operators will prefer different incisions. A vertical incision at the outer border of the rectus is probably the best. While no operator likes to leave an operation half done, there are cases in which it is better to drain an abscess and not prolong the search for an appendix. Such cases unquestionably arise more frequently with children than with adults.

[1] Boston Medical and Surgical Journal, 1908, vol. clix, p. 427.

In the series of 100 cases reported there were 21 deaths. An undue proportion of these were in children under five years of age, the mortality among them being 40 per cent. As other writers have reported similar statistics, it is safe to affirm that the prognosis in children under two years of age is very bad, and the prognosis in children between two and five is distinctly worse than in older children.

Complications of Appendicitis. *Subphrenic Abscess.* It is difficult to estimate the frequency with which subphrenic abscess occurs in connection with appendicitis. Weber found it 9 times in 350 cases, while Moschowitz found it only 8 times in 2000 cases. Eisendrath[1] has been able to collect reports of 106 cases. The exact location of the pus was given in 75 cases. In two-thirds of these it was intraperitoneal, and in one-third, extraperitoneal. In all but a few cases it was situated on the right side. There are usually three modes of onset: (*a*) An acute form, in which the symptoms appear with the attack of appendicitis or a few days afterward; (*b*) a subacute form, in which signs of infection occur a few weeks after the beginning of the appendicitis; and (*c*) a chronic form, in which the symptoms appear months after the appendicular disease has been recognized or operated on.

If a patient who has been operated on for appendicitis has a continued rise of temperature and other symptoms of sepsis, one should think of the possibility of subphrenic abscess. Downward displacement of the liver and an area of dulness, with a convex upper border continuous with the liver dulness, and the finding of fetid pus on puncture are characteristic symptoms. Differentiation from empyema may be difficult.

The abscess may be drained through an abdominal incision, through a lumbar incision, or through an incision in the diaphragm after resection of the ribs. The choice of route depends on the situation of the abscess.

Pyelitis. Hunner[2] mentions four cases in which appendicitis was complicated with pyelitis in such a manner that the urinary symptoms were prominent, and to a certain extent misleading. In one case the attacks of appendicitis were accompanied by pain in the bladder, or by a throbbing in the rectum. In the second case, lumbar pain was preceded by frequency of micturition, and the urine contained blood and casts. In the other two cases there was pain in the bladder and the urine contained some blood. In all of these patients the urine was normal as soon as the attack of appendicitis had passed over.

Fibrous Tumors following Appendicitis. Inflammatory tumors of the abdominal wall following appendicitis are due to an inflammation extending slowly and leading not to suppuration and breaking down of the tissue, but to development of a fibrous mass which permeates the muscular layers. Such a tumor may be situated in the appendicular region,

[1] Journal of the American Medical Association, 1908, vol. l, p. 751.

[2] Ibid., p. 1328

or it may extend away from it. It may be mistaken for a true newgrowth, especially one of the connective-tissue type (desmoid). In the centre of the fibrous tissue will be found frequently a small abscess, the drainage of which will insure the gradual disappearance of the surrounding swelling. Extirpation is therefore unnecessary. The permanent cure is to be found in the removal of the source of infection. The prompt treatment generally employed in cases of appendicitis renders this complication a rare one.

Meyerson[1] mentions three cases occurring in the surgical clinic in Breslau within a period of twenty months. In two of these cases there was a slowly developing painful tumor following an acute attack of appendicitis, although it was not recognized as such at the time. Operation revealed the fact that the appendix had become attached to the anterior abdominal wall, and that by its perforation the hard inflammatory mass had developed. In the third case the inflammatory thickening developed around a sinus, following an operation for appendicitis with drainage; the sinus having closed spontaneously. Records of the examination of these and similar cases show that such an inflammatory tumor may follow not merely the direct attachment of the appendix to the anterior abdominal wall, but also indirectly through the lymph channels when the space between the appendix and the anterior abdominal wall has been filled in by adherent loops of intestine. In this manner the tumor may develop at a distance from the usual site of the appendix. In one of Meyerson's cases it was in the left hypogastric region.

Schloffer[2] has seen a number of instances in which similar tumors developed after a radical operation for *hernia*. The usual history is that the wound heals primarily; the patient goes about, but soon afterward notices a swelling either in the site of the scar or in its immediate vicinity. This gradually increases, with very little tenderness and little or no fever. When this fibrous mass is cut into there is found in its centre a little pus and generally a silk ligature.

Sometimes an inflammatory tumor of this sort follows the spontaneous closing of a fistula, which in turn was left by an acute abscess after an operation. Its true nature under such circumstances is likely to be overlooked. In one of Schloffer's cases the tumor developed three years after the operation. In every instance the tumor developed so slowly that the possibility of an actual newgrowth had to be considered, having lasted in two instances more than eighteen months before the patient sought relief by operation. It is worthy of notice that rest in bed and the application of warm, moist compresses caused reduction in the size of the tumor in about one-half of the cases.

From time to time many single instances of inflammatory tumors have

[1] Beit. z. klin. Chir., 1908, vol. lx, p. 221.

[2] Archiv f. klin. Chir., 1908, vol. lxxxviii, p. 1

been reported, due to the presence of some foreign body either in the abdominal cavity or in the abdominal wall. In one case the tumor involved the right half of the abdominal wall, extending into the pelvis, and involving the omentum and cecum. It was cut into and considered to be an inoperable sarcoma. A pathological examination was made, and the tumor pronounced either a fibrosarcoma or actinomycosis. Later, an abscess ruptured spontaneously, discharging about one quart of pus, and revealing the fact that a fish bone had perforated the wall of the cecum.

Pin-worms in the Appendix. Wakefield[1] removed an appendix in the interval, and found in its distal end a nest of six or eight pin-worms (Oxyuris vermicularis). Several operators have reported the occurrence of round-worms, but the occurrence of pin-worms so far from their usual habitat is a rarity.

Technique of Appendectomy. Pennington[2] has devised an ingenious instrument for ligating an appendix within the cecum. The instrument is passed into the cecum threaded. It is then expanded to a Y within the cecum, the thread being carried across from one tip of the Y to the other. The appendix is then inverted into the cecum, passing into the Y, and the instrument is withdrawn, leaving a loop around the appendix. The ligature is tied and the appendix allowed to slough.

The ingenuity shown in this apparatus is worthy of a better field. Why one should do blindly within the cecum that which can be better done under the direct guidance of eye and sense of touch is beyond comprehension.

In removing an appendix in the interval, and also in many acute cases, Lilienthal[3] finds it of great advantage to reduce the handling and exposure of intestine to a minimum, by first locating the cecum through a small incision, then following it to the base of the appendix. He passes a ligature around the base of the appendix, through its mesentery. This he uses later for ligation of the appendix. In the meantime he makes traction upon it, and is able to deliver the appendix bit by bit even when there are a good many adhesions, ligating and dividing its mesentery as it is presented. This technique, which no doubt will seem familiar to many operators as similar to their own practice, is much to be recommended in cases in which gangrene or considerable collections of pus or extensive adhesions do not make it impractical. The result is a minimum of shock and the prevention of numerous adhesions which invariably follow continued manipulation of the gut.

Black[4] lays stress upon the proper method of inserting a purse-string suture of the stump, in order to avoid any possible hemorrhage in amputa-

[1] Journal of the American Medical Association, 1908, vol. l, p. 1904.

[2] Ibid., p. 1262.

[3] American Journal of Surgery, 1908, vol. xxii, p. 97.

[4] New York State Journal of Medicine, 1908, vol. viii, p. 374.

tion of the appendix. The practice generally followed of inserting the needle only partially through the cecum he points out to be a dangerous one. The portion of the suture which appears on the peritoneal surface of the cecum constricts no tissue when the suture is drawn tight. It is only the portion that passes through or under the wall of the cecum during its insertion that has a constricting power when the suture is drawn tight.

FIG. 35.—Purse-string suture as usually applied, Lembert style: *a*, tissue which will not be constricted when the suture is tied; *b*, tissue which will be constricted. (Black.)

These facts are clearly seen by reference to the accompanying figures, showing the cecum in its natural position and when turned wrong side out. Where the suture appears on the outside, as at *a*, Figs. 35 and 36, there can be no constriction of the tissues; where it disappears from the outside, as at *b*, there will be constriction, especially if it passes right through the wall of the cecum. If there should happen to be a blood-vessel at *a*, it can easily continue to bleed after inversion and tying. Black's plan is, therefore, to pass a silk suture through quarter sections of the cecum, bringing it out and inserting it again as near as possible to the point of exit. When such a suture is tied, it includes almost all of the tissues of the cecum. One of the four loops should invariably pass under the meso-appendix, in order to include any vessels that are there present. The essential point in this technique is to remember that all of the tissue beneath which the suture passes will be constricted when the stump is inverted; in other words, a Lembert suture is intended to approximate serous surfaces and not to control hemorrhage.

FIG. 36.—Cecum everted to show the internal relations; letters the same as in Fig. 35. (Black.)

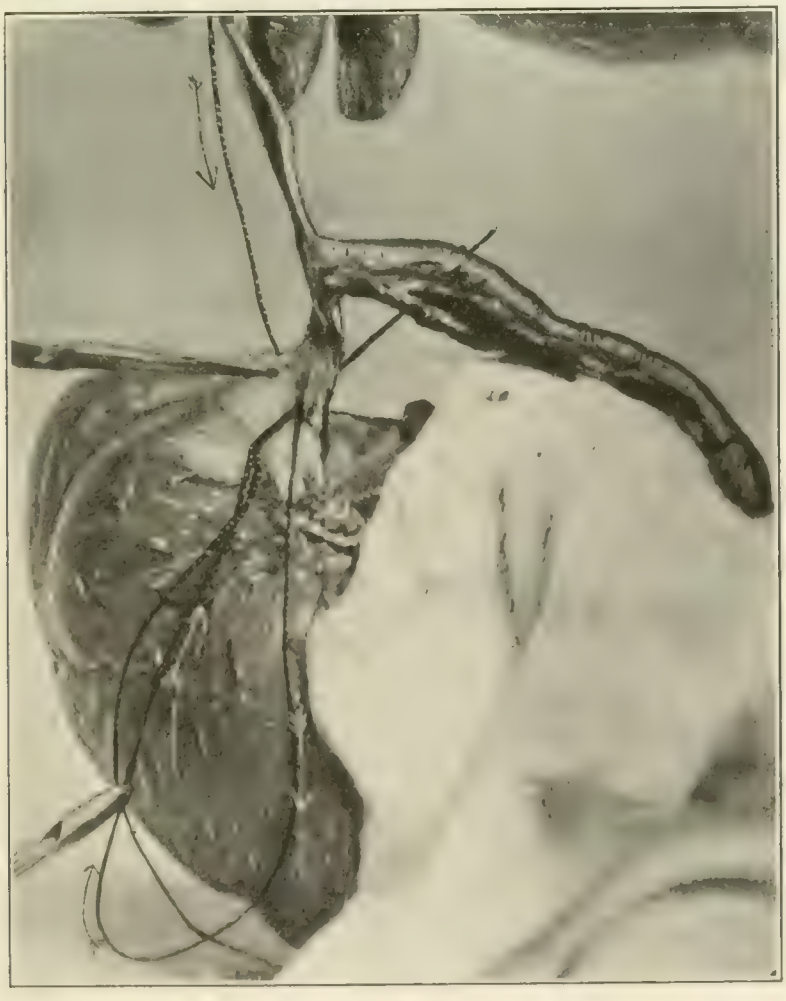

FIG. 37.—Correct method of inserting purse-string suture. The tissue at the point of the forceps corresponds to the tissue at *b*, Fig. 35. (Black.)

Deavor[1] follows a simple technique in treatment of the appendicular stump. He uses three ligatures: one for the meso-appendix, one for the stump of the appendix after a peritoneal cuff has been pushed back He then amputates the appendix, and disinfects its lumen by means of a drop of carbolic acid applied on a blunt probe without cotton. The peritoneal cuff is then brought over the appendicular stump and ligated. Deavor makes a good point in connection with the use of ligatures. As is well known, catgut, whether chromicized or not, lengthens when moistened with water. Hence, if a dry ligature, or one which has been taken directly from an alcoholic or other non-aqueous solution, be employed, its tendency will be to loosen as it absorbs water from the tissues.

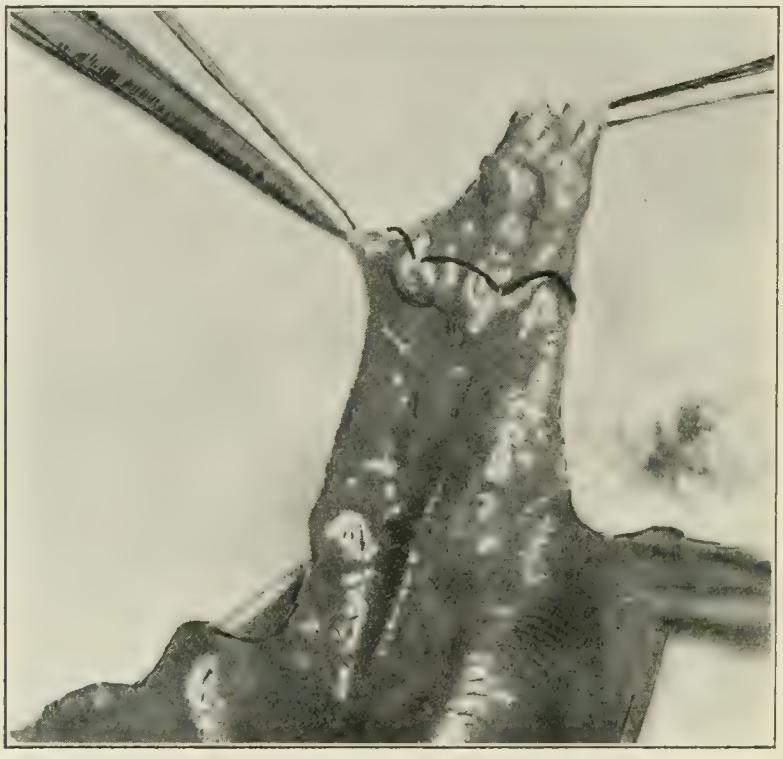

FIG. 38.—Cecum inverted to show relations of a purse-string suture properly inserted. All of the tissue under the loops will be constricted when the suture is drawn taut. (Black.)

Every such ligature should therefore be soaked for a minute or two in water, or an aqueous solution, in order to permit it to stretch before it is applied.

Carcinoma and Sarcoma of the Appendix. Harte[2] has been able to assemble for study 120 cases of carcinoma and sarcoma of the appendix. In most instances the tumor was not recognized previous to operation, the usual diagnosis being chronic appendicitis. Indeed, in many cases the diagnosis was made by a pathologist who examined the excised appendix as a routine duty. It follows, therefore, that most of these

[1] New York State Journal of Medicine, 1908, vol. viii, p. 399.

[2] Transactions of the American Surgical Association, 1908, p. 399.

patients were at the period of life during which appendicitis is common, and, furthermore, that those surgeons who have a pathological examination made of all removed appendices will find a good many instances of carcinoma. Some writers have placed this as high as 1 per cent.

Le Conte calls attention to the fact that in a few cases the carcinoma extends beyond the appendix, and has, therefore, a more than pathological interest. He reports such a case occurring in a girl aged twenty-one years. The appendix, cecum, and a few inches of ileum, together with the ileocolic glands, were removed, and a lateral anastomosis between the ileum and ascending colon was performed. The patient made a prompt recovery. Microscopic examination showed that the carcinoma had invaded the cecum and at least two of the lymph nodes.

Le Conte suggests two theories to explain the findings in this case: one that the tumor was for a long time a benign one, but finally invaded the cecum and developed malignant characteristics with metastasis; the other theory is that the appendix had been the seat of long-standing inflammation, which had recently undergone malignant changes.

Other surgeons agreed with Le Conte that there are two distinct types of carcinoma occurring in the appendix. One occurs in younger patients, and is characterized by the smallness of the cells, by slow development, and absence of metastasis. The other occurs in persons in the cancer zone of life. In such cases the prognosis is much graver, as the tumor shows a tendency to invade surrounding tissues.

In discussion of this paper, Coley mentioned a case of primary carcinoma of the appendix extending to the cecum and ileocecal glands, in a patient aged forty-eight years.

Johnston[1] reports a case of *diverticulum of the appendix*, with chronic inflammation, which was considered upon gross examination to be a positive adenocarcinoma.

Microscopic examination showed that the mucous membrane of the lumen of the appendix was continuous with that of the diverticulum throughout, and that there was no evidence of adenocarcinoma.

THE LARGE INTESTINE.

Inflammation of the Sigmoid, or Diverticulitis. Acute inflammation of the sigmoid, often leading to a perforation, and an abscess cavity outside of the wall of the bowel, and usually retroperitoneal, has come to be recognized as a not very rare surgical affection of the abdomen. An inflammatory process of this sort is thought to be connected with a diverticulum of the sigmoid, either congenital or acquired; at any rate, the perforation has usually taken place through such a diverticulum, and

[1] Transactions of the American Surgical Association, 1908, p. 599.

in some cases of long standing there have been multiple perforations. The name diverticulitis is meeting with general acceptance, and bids fair to drive out of use the older term "sigmoiditis" or "perisigmoiditis," just as the term appendicitis drove out of use the terms "typhlitis" and "perityphlitis."

But the presence of false or acquired diverticula of the intestine has been known for a long time, and the pathological importance has occasionally been referred to. Thus, nearly forty years ago, Loomis[1] reported a case of acquired diverticulitis which proved fatal, which was apparently due to three false diverticula of the descending colon and sigmoid flexure, as the peritonitis was most acute in their situation, although no perforation could be made out. In 1858 Jones[2] reported a case of multiple diverticula of the sigmoid, one of which ulcerated and caused a communication between the bowel and the bladder. The patient lived in this condition ten months.

No doubt many other isolated instances of disease due to diverticula were recorded, but the subject was first brought to general notice by Graser.[3] He showed that the circular and longitudinal muscular layers of both the small and large intestine present numerous gaps, through which the mucous membrane projects outward for a slight distance, and that this deficiency of the muscular wall is especially striking in the case of the sigmoid flexure. These openings are usually situated at the points where bloodvessels perforate the muscular coats, and are seen most frequently in individuals in whom there is a venous congestion due to disease of the heart, lungs, or to changes in the portal circulation, or to abdominal tumors, or to chronic constipation. These things he regarded as predisposing causes, the exciting cause in most cases being an excessive accumulation of fecal matter, with a distention of the intestine due to gas. In the beginning the mucous membrane in a diverticulum remains normal; later it becomes filled with hardened fecal matter, and a pressure atrophy results; and still later, if these unfavorable conditions continue, ulceration and even perforation may take place. Peritonitis may develop even though no visible perforation is present. Without doubt some of the cases of chronic mesenteric peritonitis in the vicinity of the sigmoid are due to secondary changes which are the result of inflammation in these acquired diverticula.

Subsequent investigation has confirmed the principles laid down by Graser, and has added not a little to our knowledge of this subject. In 1904 Beer[4] summed up the newer knowledge on this subject, but was able to add very little to what Graser had already found out. Acquired diverticula occur frequently in the small intestine, but rarely, if ever, are

[1] Medical Record, 1869, vol. iv, p. 497.

[2] Record of the Transactions of the London Pathological Society, vol. x, p. i.

[3] Archiv f. klin. Chir., 1899, vol. lxix, p. 638.

[4] American Journal of the Medical Sciences, 1904, vol. cxxviii, p. 135.

followed by a serious inflammatory process, probably because the fluid contents of the small intestine do not give rise to pressure necrosis. He classified the results of inflammation in the diverticula which had up to that time been recorded, in literature, as follows: stenosis of the sigmoid, 6 cases; perforation of the peritoneum, 4 cases; localized peritonitis or abscess in the left iliac fossa, 3 cases; perforation into the urinary bladder, 15 cases; mesenteritis, several probable cases in which the connection between diverticula and the inflammation was not definitely shown; carcinoma, one definite case, reported by Hochenegg. The possibility of carcinoma developing in an ulcerated diverticulum is a strong one, and invites further investigation.

Within a year Telling[1] has given perhaps a fuller description of diverticula of the sigmoid than can be found elsewhere. Acquired diverticula are especially frequent in the lower part of the descending colon and the sigmoid. Here they occur mainly in two rows, either at the side of the gut or close to the mesenteric attachment, more rarely on the convexity. Perhaps the commonest situation is in the appendices epiploicæ. The minute ones are semiglobular. As they grow they become flask-shaped. They are of all sizes up to a hazelnut, rarely larger. The connection with the lumen of the bowel is generally smaller than the diameter of the diverticulum, a point of great importance clinically. They are almost always filled with hardened fecal material. Their walls may contain all the coats of the bowel, although in many cases the muscular coat is absent or scanty.

No case has been reported in a child, the youngest patient being twenty-two years. The average age in eighty cases was sixty years. Most of the patients were fat at the time, or had been so. Constipation and flatulence are other favoring causes. That there may exist an abnormal congenital arrangement of the muscularis predisposing to the development of diverticula is possible, but at present is unsupported by facts.

These diverticula give no trouble until they undergo secondary pathological changes, the earliest of which is an atrophy of the muscular fibers and of the mucous glands, *i.e.*, a process of thinning. There are evident mechanical difficulties connected with the expulsion of the fecal contents into the lumen of the bowel. Fecal concretions, therefore, tend to form which will still further enlarge the diverticulum and thin its wall. There will thus be opportunities for inflammatory changes in their various forms, such as chronic hyperplastic peridiverticulitis, leading to formation of a tumor or stenosis of the bowel, with chronic obstruction, or to development of carcinoma, the formation of adhesions, and a tendency to perforation of other viscera. There can be no doubt that many cures reported of carcinoma have occurred in cases of this kind.

Another recent writer, Neupert,[2] concerns himself especially with the

[1] British Medical Journal, 1908, vol. ii, p. 1346.

[2] Archiv f. klin. Chir., 1908, vol. lxxxvii, p. 953.

perforation into the mesosigmoid; the results of chronic suppurative inflammation; the development of much fibrous tissue, and cicatricial contraction of the meson. This may kink the sigmoid and lead to intestinal obstruction. One can readily see how easily such a condition may be mistaken for carcinoma. In such cases the ulceration is extensive; or the suppuration may be so great as to make a diagnosis difficult.

A man, aged forty-three years, whose previous health was excellent, suffered for several months from indefinite pain in the abdomen, which gradually became colicky. Symptoms of acute obstruction were then added. Upon examination the abdomen was found distended, and there was a hard, immovable, somewhat tender tumor lying against the posterior wall a little below the umbilicus. The rectum was empty, and rectal injections failed to produce an evacuation of fecal matter. The abdomen was opened, adherent coils of small intestine were separated, and a hard mass was found in the posterior and left lateral walls of the pelvis, closely connected with the sigmoid flexure. It contained numerous fistulous passages and considerable foul pus. A diagnosis of suppurating carcinoma was made. The abscess was drained, and an artificial anus was established in the cecum.

Two days later the patient died of acute peritonitis. Examination of the sigmoid showed that there were a great number of false diverticula, from one-quarter to one-half inch in diameter, for the most part tightly packed with hardened feces, and connected with the lumen of the sigmoid by very narrow openings. Four of these diverticula had perforated into the mesosigmoid. These perforations led into an abscess cavity extending upward toward the median line, in the root of the mesosigmoid, and this cavity was surrounded by dense fibrous tissue. At the side of the perforations the sigmoid was bent at a right angle. Its mucous membrane lay in folds, but was intact, except as above mentioned. The various layers of the wall were greatly thickened.

The treatment of the patient with such advanced inflammatory changes must always remain unsatisfactory. As attention is more and more directed to this subject, operation will be possible at an early stage. Already, Gussenbauer, Westermann, and Stierlin have all resected successfully the damaged portion of the sigmoid.

So far as the etiology of these cases is concerned, the theory of venous congestion advanced by Graser has been attacked by several writers who have advanced other possible causes, such as atrophy of the muscles due to old age, cachexia, sudden emaciation in stout persons, and marked constipation. It is evident that not one theory yet advanced will explain all cases, since diverticula are found in young and old individuals, in those who are emaciated and those who are stout, as well as in persons who have never suffered from venous congestion nor from constipation.

Neupert mentions the case of a large diverticulum connected with the

transverse colon. There were also numerous smaller ones in the transverse colon, while the descending colon and sigmoid flexure were free. The ileum was therefore anastomosed with the sigmoid, and the ascending and transverse colon were removed. The diverticula in this case were considered to be both congenital and acquired.

Zacharie[1] reports a case in which the right side of the sigmoid perforated, and the pain and abscess cavity were situated to the right of the median line, simulating appendicitis. A mass the size of a small orange was situated to the right of the right rectus muscle. It was cut into and a cupful of thick, yellow, foul-smelling pus escaped. The intestines around the abscess were matted together. The appendix was only slightly inflamed. At the bottom of the cavity were found three enteroliths about the size of a very small pea, and near by was a highly inflamed loop of the sigmoid flexure, on the right border of which could be seen the gangrenous remains of a perforated diverticulum, with gas and feces escaping. The cavity was washed and drained. A fecal fistula resulted, which closed spontaneously in five weeks.

Brewer[2] reports an interesting case of diverticulitis occurring twice in the same individual. The first attack was followed by rupture, and the resulting abscess was drained. A fecal fistula persisted for six weeks, and then closed spontaneously. The patient remained in perfect health for five years and four months. He then suffered a second attack, which was so similar to the first that he made his own diagnosis. An operation was performed by Flint. The upper part of the sigmoid was deeply injected and edematous. On its median side was an acutely inflamed diverticulum, covered by edematous peritoneum (Fig. 39), to which there were attached a number of greatly swollen appendices epiploicæ. Examination showed that there were no other diverticula present. The inflamed diverticulum fluctuated, and evidently contained pus. It was stitched in the wound and allowed to rupture spontaneously. The cavity of the diverticulum connected with that of the sigmoid by a minute opening. This closed spontaneously in three weeks, during which time the necrotic walls of the diverticulum sloughed away. The superficial wound was then closed by suture.

These cases are reported in order to show the probable results of different forms of operative treatment. If the diverticulum is small or is attached to the bowel by a narrow pedicle, it should be removed and the resulting intestinal wound closed by suture. If the diverticulum is large, and attached by a broad base, or if the wall of the sigmoid is too much infiltrated to warrant suture, the inflamed portion of the bowel should be brought outside of the peritoneal cavity, or so surrounded by gauze as to make its position virtually extraperitoneal, so that healing by granulation may take place without further injection of the peritoneal cavity.

[1] New York State Journal of Medicine, 1908, vol. viii, p. 308.

[2] Journal of the American Medical Association, 1908, vol. li, p. 543.

Tuberculosis of the Sigmoid. Midway between diverticulitis of the sigmoid and malignant disease, and presenting appearances and symptoms which may lead to diagnosis of one or the other, is tuberculosis of the sigmoid. This is not a common seat of tuberculosis, and on this account the true nature of the lesion is likely to be overlooked. There are cases in which the tuberculosis is only one among numerous tuberculous lesions of the abdomen or other portions of the body, but there are also instances in which the tuberculosis exists in the sigmoid alone, producing either ulceration or stricture, or both, and presenting just as it may in the cecum a hard nodular tumor which without a microscopic

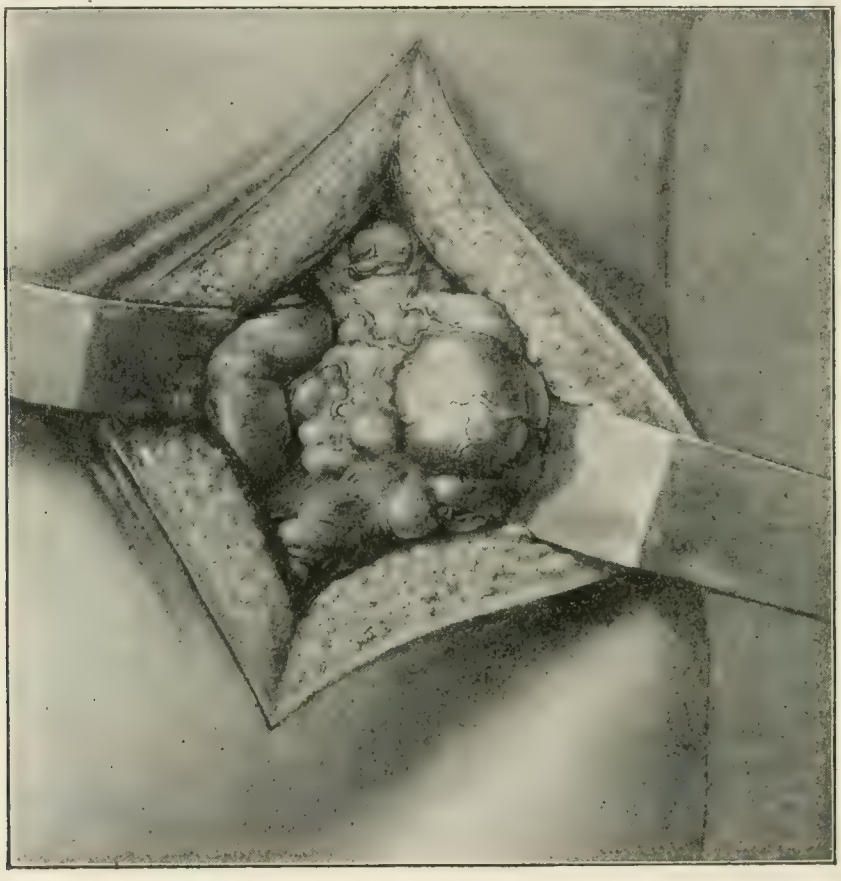

FIG. 39.—Acute diverticulitis. (Brewer.)

examination may easily be mistaken for carcinoma. It is not definitely decided whether such a lesion begins in the mucous membrane of the sigmoid, or whether, as Holland claims for the case which he reported, as an infection of the mesenteric glands from which it spread by continuity to the sigmoid, and by involving the serosa brought about a stenosis.

In a case reported by Boese[1] it seems clear that the disease began in an ulceration of the mucous membrane followed gradually by the formation of sufficient scar tissue to make a stenosis. The patient was a man aged fifty years, with an excellent family and personal history. He suffered for

[1] Archiv f. klinische Chirurgie, 1908, vol. lxxxvi, p. 1071.

some years with obstinate constipation, relieved with difficulty, and attacks of colic before he noticed a tumor. There was no rise of temperature, and in the absence of evidences of tuberculosis elsewhere, it is no wonder that a diagnosis of malignancy was made. The tumor was excised and examined, and presented the appearances of a chronic tuberculosis. Great numbers of tubercle bacilli were demonstrated in the sections. This is probably the first tumor of the sigmoid in which the bacilli have been demonstrated in the sections. It was considered likely that the starting point for this tuberculous ulceration may have been one of the diverticula of the sigmoid, but it was impossible to determine this positively on account of the advanced state of the inflammation which existed at the removal of the strictured bowel. This theory is in keeping with the best opinion in regard to non-tuberculous inflammation of the sigmoid, whether acute or chronic

Megacolon, or Hirschsprung's Disease, as it is generally called in Germany since this writer published his article upon it in 1886, continues to excite discussion on account of the uncertainty of its origin. It is a dilatation and hypertrophy of the colon without demonstrable cause. Many writers have looked upon it as congenital, as it frequently occurs in childhood. Among them is Hirschsprung himself. Others, among them Fenwick and Treves, believe that the dilatation of the colon is first the result of mechanical obstruction, due either to a volvulus or a congenital stricture, or to a spastic contraction. They believe that when the dilatation has passed a certain point it may continue, or possibly increase, even though a mechanical obstruction be removed. Other writers have explained megacolon as the result of dilatation due to colitis and fermentation of the intestinal contents; still others have attributed it to the development of valves or kinks; while Ibrahim asserts that an undue length of the sigmoid is a sufficient cause for megacolon. Figs. 40 and 41 give a good idea of the appearance of the patient before and during operation. It is extremely difficult in some cases to exclude the obstructive effect of a kink or valvular formation. In the case here illustrated, pressure upon the descending colon failed to cause the passage of gas or fecal matter through the anus until the position of the distended colon was altered. Even then the escape was so imperfect that colostomy was performed.

Even the colostomy only partially relieved the dilatation, and when the patient died of peritonitis, on the sixth day, the whole colon was much dilated and had hypertrophied.

The treatment of megacolon has varied in accordance with the varying ideas of its origin entertained by different men. So far as the medical treatment is concerned, irrigations from below are of more service than laxatives by mouth. The forms of operative treatment that have been performed with success thus far are: (1) Puncture of the intestine, a risky procedure which is not to be recommended unless the abdomen has been opened; (2) suture of the sigmoid flexure to the front or right side of the

abdominal wall, the idea being to prevent kinking; (3) anastomosis, which has usually been performed between the ileum and lower portion of the sigmoid or rectum; (4) colostomy; (5) resection and suture of half or more of the colon, which has been performed a number of times. It has the merit of being curative to an extent that none of the other operations are. Recently the Italians have advocated a new procedure (6) called "plication." It consists in making a number of longitudinal folds in the distended colon without opening its lumen. It is worth while remarking that this operation has been followed by recurrence of the symptoms in at least one instance.

FIG. 40.—Megacolon or Hirschsprung's disease. (Petrivalsky.)

FIG. 41.—Appearance of the dilated colon when spread out over the abdomen. (Petrivalsky.)

With reference to the etiology of this interesting disease, Petrivalsky[1] believes from a careful study of all that has been written on the subject, that the mesentery is primarily at fault, and that it is poorly developed, and contains weak vessels with an insufficient amount of elastic fiber; that

[1] Archiv f. klin. Chir., 1908, vol. lxxxvi, p. 318.

the condition involves the whole intestinal tract, and not merely the large intestine. As a result of this, the dilatation may take place either before or after birth, and that while kinking or valve formation may add to the gravity of the situation, they are not responsible for the starting of the abnormality.

FIG. 42.—Megacolon, with a normal colon for comparison. (Formad.)

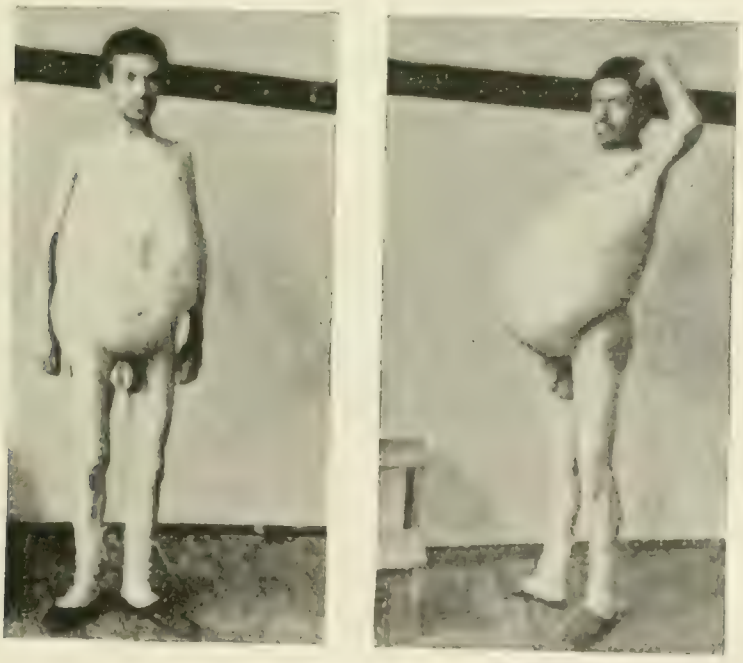

FIG. 43.—Megacolon. (Formad.)

Recently, Finney[1] has published a long article on this subject with a very complete bibliography and a number of illustrations. Among them the photographs of Formad's case are reproduced. This case was reported in 1892, but none of the later ones shows in any more striking manner the gross changes which take place (Figs. 42 and 43).

The lesions of the disease, according to Finney, are always more marked in the sigmoid, and this may be the only part of the colon affected. The

[1] Transactions of the American Surgical Association, 1908, vol. xxvi, p. 475.

distended colon may be very large, holding in one case reported sixteen liters, and in another, fifty pounds. The wall of the affected portions shows a quite uniform hypertrophy, though that of the muscular part is especially well marked. Associated with the hypertrophy there is dilatation. In advanced cases there may be necrosis or perforation, with resulting peritonitis. Sometimes the mesocolon is greatly thickened. On microscopic examination the changes of chronic inflammation are especially marked in the mucosa, while the hypertrophy of the muscular coats is extreme. In other cases there has been noted a great thickening of the submucosa. While it is established beyond question that in many cases of megacolon no obstruction exists at the time of observation, different writers are coming more and more to the view that obstruction at some former date was the starting point of the hypertrophy and overdevelopment, even in the so-called congenital cases.

Fig. 44.—Shows the effects of exclusion of the large intestine. (Alglave.)

Effects of Exclusion of the Colon. Those who look upon the large intestine as a mere reservoir of fecal matter, from which the fecal stream may be diverted with impunity, should study the photographs of dogs and and pigs, in connection with an article by Alglave.[1] Three of his illustrations are reproduced here. In Fig. 44 the white dog at the left had a simple ileosigmoid anastomosis seven months previous. He remained in good condition. The wretched pup on the right was subjected on the same date to an ileosigmoid anastomosis, plus a unilateral exclusion of the large intestine. In other words, the ileum was in his case cut across and the upper end implanted into the sigmoid, while the lower end was closed.

Fig. 45 shows two pigs of the same age, the smaller one of which was operated upon four months before the photograph was taken. An ileo-

[1] Rev. de Gyn. et de Chirurg. abdom., 1907, vol. xi, p. 51.

sigmoid anastomosis with exclusion was carried out. This pig died two weeks after the photograph was taken. The other pig had no operation.

In Fig. 46 the pig at the left was operated on at two months, a simple ileosigmoid anastomosis without exclusion of the large intestine being performed. The other pig was operated on at three months of age.

FIG. 45.—Two pigs, one having had an ileosigmoidostomy with exclusion of the colon. (Alglave.)

They were one year old when the photograph was taken, and weighed respectively seventeen kilos (about thirty-four pounds) and thirty-nine kilos. An unoperated pig from the same litter weighed one hundred kilos. Here was a delay in development, but the animals seemed healthy.

FIG. 46.—Pigs after the ileosigmoidostomy. (Alglave.)

Alglave found that unilateral exclusion of the large intestine has a very bad effect on the health of a dog; for its large intestine is short (two or three feet); that it causes death in a pig in five months or less, the pig's large intestine measuring about seven feet; and that it is speedily fatal in the herbivorous animals, whose large intestine is even longer than in the pig.

A simple ileosigmoid anastomosis in the dog and pig has no very marked effect upon the health, but delays development if performed upon a young pig. It is fatal for the herbivorous animals.

As man occupies a place between the carnivorous and herbivorous animals, are not the effects of exclusion of the large intestine of the pig in a way comparable to those of a similar exclusion in man? And there is not lacking clinical evidence to show the bad effects of ileosigmoidostomy. Certainly, Hartmann speaks with authority when he says[1] that a permanent diarrhea will follow ileosigmoidostomy unless the fluid fecal matter which flows from the ileum after passing into the large bowel has a back flow into the colon. He has known a case in which this operation was performed, and the portion of the ileum still remaining attached to the cecum was closed (unilateral exclusion of the large intestine). An opening was made in the ascending colon, which continued to discharge formed fecal matter, while fluid feces came through the normal anus, thus showing that a part of the fecal stream went backward through the colon.

Resection of the Large Intestine in two steps, as first suggested by Bloch, and later advocated by Mikulicz, has given a great stimulus to the operative treatment of *cancer of the large intestine*, so much so that Petermann[2] is able to report the results in twenty-three operations of this character performed in Rotter's clinic in Berlin. The tumor was situated in the cecum in three cases; in the hepatic flexure once; in the transverse colon four times; and in the sigmoid fifteen times. Two patients died after the first part of the operation, *i.e.*, the freeing of the tumor, and bringing it outside of the peritoneal cavity. In both instances there was extensive involvement of the lymphatic glands, the removal of which prolonged the operation beyond the resisting power of the patient; in other words, the condition was too far advanced to warrant an attempt at radical operation.

It is important at the first operation to approximate the serous surfaces of the upper and lower portions of the affected loop of bowel, and to fix them by suture for a distance of four or five inches. When this is done the subsequent crushing of the intervening spur or septum is facilitated, and can be performed without much risk, and frequently without any pain. When possible the parietal peritoneum and skin are stitched about the neck of the portion of bowel which has been brought out of the abdominal cavity. In many cases this can be only partially performed; the remaining gap can be tamponed. It is impossible to state in just how many days it is safe to crush the septum. If the approximation above spoken of is readily obtained, and the wound heals without deep suppuration, but a few days is sufficient; in other cases it may be necessary to wait three weeks or more.

In eighteen of the cases reported by Petermann the spur was crushed, in ten of them to a sufficient depth by the first attempt; in the others it

[1] Zentralblatt f. Chirurgie, 1907, p. 1452.

[2] Archiv f. klin. Chir., 1908, vol. lxxxvi, p. 53.

was necessary to repeat the crushing in order to effect an anastomosis sufficiently deep to permit the external opening in the bowel to be sutured without risk of a stricture. A special instrument may be used to crush the spur, but if this is not at hand, a long, light, slightly curved pedicle clamp answers the purpose very well. It is probably better to postpone the closure of the artificial anus until the division of the spur is seen to be sufficient, and that it does not tend to reform.

Four of Rotter's patients came back for further treatment on account of stricture formation. Rotter lost one patient from peritonitis following the crushing of the spur. Examination showed that the ascending and descending portions of the loop of intestine were not sufficiently approximated, so that when the crushing was performed the peritoneal cavity was opened. With the exception of these accidents, his patients did well, thus showing the safety of this method of operating in cases in which the portion of the intestine with the tumor can be brought to the surface, and the ascending and descending portions of the loop accurately approximated.

Cavaillon and Perrin[1] are also in favor of resecting cancer of the descending colon and sigmoid in three stages. They report a number of cases in detail, stating that this method of operating has reduced the mortality from 40 to 60 per cent. to about 20 per cent. If the cancer is in the ascending or transverse colon, so that an ileocolostomy may be performed after its removal, it is safe to complete the operation at once.

Moynihan[2] claims that the descending colon and the upper part of the sigmoid retain their vitality after division of the inferior mesenteric artery. If this shall prove to be generally true, the mobilization of these parts may be carried out to a degree not hitherto practised. This will be of advantage, not merely in the resection of the sigmoid for cancer by the method here described, but it will also favor the abdominal route in operations for cancer of the rectum. It is only by this route that the whole of the lymphatic area can be exposed and properly treated.

Operation to Relieve Artificial Anus. Brown[3] advocates bilateral intestinal exclusion for the relief of artificial anus. This insures an accurate and immediate restoration of the intestinal continuity, and it leaves undisturbed the firm scar produced by the irritation of the artificial anus, which in itself is a protection against hernia. This is particularly true in cases of fecal fistula following strangulated hernia. He reports three cases in which he has operated in this manner with satisfactory results.

A New Position for Rectal Examination. Hanes[4] suggests a new position for the patient for the purposes of examination and treatment of

[1] Revue de Chirurgie, 1908, vol. xxxvii, p. 761.

[2] Surgery, Gynecology, and Obstetrics, 1908, vol. vi, p. 463.

[3] Cleveland Medical Journal, August, 1908.

[4] Journal of the American Medical Association, 1908, vol. li, p. 1131.

the rectum and sigmoid flexure. The patient lies face downward upon a table, and then pulls himself forward until his head, shoulders and body hang over the front of the table. He is supported in this vertical position by resting the shoulders on two chairs, separated sufficiently to permit the head to hang between them, or by resting the head and folded arms upon one or more pillows on the floor. In this position the abdominal viscera gravitate toward the diaphragm, and the sigmoid and rectum are approximated to a straight line. A proctoscope may then be readily passed; but the chief advantage of the position lies in the fact that as soon as the instrument is introduced, the bowel beyond its distal end balloons out and fills with air, thus greatly facilitating the inspection of its surface. This position can be maintained for fifteen or twenty minutes by some patients without serious discomfort.

Amputation of Sphincter Ani and Rectum. Dudley[1] suggests a comparatively bloodless method of amputating the sphincter and rectum in cases of prolapse. He dilates the sphincter and pulls down the loosened bowel, and fixes it by two long Kocher mouse-toothed forceps applied to the anterior wall. The cylinder of prolapsed bowel is then split up as far as the forceps reach, and a catgut suture is inserted. From this point a circular amputation is performed in the following manner: A clamp is applied to both portions of the bowel a little higher up than the permanent suture; the prolapsed bowel is cut away for a distance of half an inch; the cut margins are seared with the cautery; the clamp is removed and a continuous lock-stitch of chromic catgut is inserted. The clamp is then applied to the next section of bowel to be cut away, and the various steps of clamping, cutting, searing, and sewing are continued until the circumference of the bowel has been gone over. The catgut employed should be long enough to complete the suture all the way around. By palpation, the operator can easily tell whether the prolapsed rectum contains any small intestine; if it does, this should be pushed up out of the way before the clamp is applied. It is well to have the patient in a lithotomy position, with the buttocks somewhat elevated, in order to favor the withdrawal of the small intestine from the field of operation. The application of sterilized vaseline, a few squares of gauze, and a T-bandage completes the operation. No tube or gauze should be placed in the rectum. The bowels should be moved on the third day.

THE LIVER AND GALL-BLADDER.

Pathologists and internists have been studying afresh the various inflammatory diseases of the liver and biliary passages, so that it looks as if we shall soon have a clearer conception of these diseases, and it

[1] Journal of the American Medical Association, 1908, vol. li, p. 991.

may follow from this that surgeons will have an opportunity to cure the patient before he has reached the stage of forming gallstones, instead of being content to remove the obstructions after they have formed. Indeed, there has already been no little activity on the part of some surgeons to advance this day by study and clinical observation and by operative treatment, as the paragraphs given below will show.

Acute Angiocholitis. Quenu and Duval[1] read a paper on the above subject at the second International Congress of Surgeons, held at Brussels last September. The infection may reach the liver through the ducts or the bloodvessels. The former, until recently, has been considered the usual source of infection, whereas now it appears more probable that, especially in infections due to the typhoid bacillus, the liver becomes involved through the bloodvessels during transitory infections of the blood with the bacilli. Other attacks of angiocholitis occur in pregnancy, in hemorrhoids, in strangulated hernia, and appendicitis; while still others are secondary to the development of calculi in the bile ducts. Treatment is directed toward the relief of the inflamed gall-bladder, if such exists, either by drainage or excision, and also to the relief of the angiocholitis proper. If there is perforation or threatened perforation of the gall-bladder, due to ulceration, or gangrene, or softening, it is better to remove it. If the inflammation is less severe, drainage will suffice. Treatment of acute angiocholitis consists in establishing drainage either through the gall-bladder or through the hepatic duct. Drainage in the latter situation, possibly combined with removal of the gall-bladder, seems to be employed more and more.

Hartmann does not believe that hepatic drainage alone is a sufficient treatment in cases of acute angiocholitis. It is often impossible to carry it out, and it is difficult to keep a drain very long in the canal. Premature closure of the drainage may be followed by a recurence of the high temperature. He therefore combines it with drainage of the gall-bladder.

Haaster combines hepatic drainage with what he calls a "*transhepatic lavage*," carried out through a superficial bile duct. He looks for some little dilated bile duct on the convex surface of the right lobe under the capsule, or in the superficial layers of the parenchyma. He introduces into it a fine tube, such as is used in intravenous injection, and passes into it a stream of hot saline solution. It is true that only a section of the liver is washed out, but in this manner he is able to cause a discharge through the hepatic duct of seropurulent liquid and small calculi or biliary sand and thick brown bile. He does not recommend this transhepatic drainage for all cases, but rather for those in which there is a special obstruction.

[1] Annales Internationales de Chirurgie Gastro Intestinale, 1908, vol. ii, p. 189.

Cholecystitis without Gallstones. Riedel[1] has seen six patients in whom there existed inflammation of the gall-bladder and biliary passages without the formation of gallstones. He believes that the inflammation in these cases was hematogenous, and not by direct extension from the intestine. The pain commenced in the gall-bladder, and jaundice was a later symptom. The essential of treatment is the drainage of the gall-bladder for a long period. This treatment may be effectual even though the inflammation has extended to the bile ducts in the liver—cholangitis. Removal of the bladder is comparatively useless in these cases.

Cholecystitis in Typhoid Fever. Quenu[2] calls attention to the appearance of cholecystitis either during typhoid fever or during the convalescence from this disease. If the inflammation of the gall-bladder takes place during the height of the disease, it is apt to be obscured by the abdominal distention, and the symptoms are likely to be misinterpreted. Even if the gall-bladder perforates, the perforation may be diagnosticated as intestinal perforation. If the gall-bladder is attacked during convalescence, the diagnosis is simpler. The sudden swelling and acute pain in the region of the liver, combined with high temperature and vomiting, should at least suggest the possibility of an infection of the gall-bladder.

From the thirty recorded cases in which operation has been performed for cholecystitis occurring in typhoid fever it is seen that this accident may arise at any time from the second to the sixth week after the beginning of typhoid fever. The treatment has been various. In seventeen cases, cholecystostomy was performed, with 13 recoveries and 4 deaths; in 5 cases the gall-bladder was removed, with 4 recoveries and 1 death; in the remaining 8 cases the treatment was imperfect, such as an exploration without recognition of the perforated gall-bladder. Seven of these patients died. The one who recovered was treated by aspiration simply.

Records of 14 operations performed on the gall-bladder during convalescence from typhoid fever show 10 recoveries and 4 deaths. It is only fair to state that in 2 of these cases the condition of the gall-bladder was overlooked; in one an abscess of the liver was opened, and in the other the appendix was removed. Excluding these two, we have a mortality of 16.6 per cent. In regard to the technique, Quenu advises that it should be rapid, simple, and should afford drainage of the gall-bladder. Cholecystectomy should be reserved for cases of actual or threatened perforation.

Abscess of the Liver. Rogers[3] believes that the present mortality of liver abscess in the tropics can be materially reduced. The mortality after operation in the Calcutta hospitals is about 60 per cent. A large part of this is due to the postoperative introduction of staphylococci into the abscess cavity, a contamination which it is almost impossible to

[1] Mitteilungen aus den Grenzgebieten der Med. und Chir., 1908, vol. xix, p. 1.

[2] Revue de Chirurgie, 1908, vol. xxxvii, p. 828.

[3] British Medical Journal, 1908, vol. ii, p. 1246.

prevent in a hot, moist climate if the open method is followed. Four-fifths of the abscesses are free from bacteria and cocci when first opened. He prefers to aspirate the abscess with a flexible sheathed trocar, and irrigate its cavity with a solution of quinine. This may be repeated many times without the admission of air. Large doses of ipecac should be given in all cases to cure the dysentery and to prevent suppuration.

Voronoff[1] insists that abscess of the liver should always be operated on as soon as the diagnosis is made. The operation he prefers is drainage through a large thoracic incision, with resection of one rib. Suspected suppuration should be demonstrated by puncture. If puncture fails to reveal pus, the abdominal cavity should be opened and the liver explored. Resection of the costal margin without opening the pleural cavity, as recommended by Lannelongue, gives a fine exposure of the convex surface of the liver anteriorly. The operation of Petridis, that is, a resection of the seventh, eighth, ninth, and tenth ribs for a distance of ten or twelve centimeters, gives an exposure of the convex surface and posterior portions of the liver not obtained in any other way. These operations are readily performed if the spaces between the liver and diaphragm and the diaphragm and the ribs are obliterated by adhesions. If the spaces are not so obliterated, they should be sutured to guard against infection of the pleural and peritoneal cavities. If suture is impractical, the cavities should be protected by gauze compresses. When the abscess cavity has been opened, it should be drained with large tubes. Curettage of the abscess cavity is thought to insure its more rapid healing. If an abscess of the liver breaks into a closed cavity, such as the peritoneum, pleura, or pericardium, immediate operation is indicated. If it breaks into an open cavity, such as the alimentary canal, bronchi, or kidney, spontaneous recovery may occur. Under such circumstances one may delay operation unless there are symptoms of insufficient evacuation. Hemorrhage occurring during operation from wounds of important vessels of the liver may be controlled by firm gauze packing. It is useless to attempt to control it by clamps or with the thermocautery.

Chronic Inflammation of the Liver. Koch[2] summarizes the present knowledge in regard to the *surgical treatment of cirrhosis of the liver.* It has been proved both experimentally and clinically that omentopexy can relieve impaired venous circulation resulting from obstruction or stricture of the portal vein. It can also relieve ascites and the gastro-intestinal hemorrhage which occurs in atrophic hepatic cirrhosis. The operation is dangerous in advanced cases, and should therefore not be postponed too long. Relief from the obstructed circulation may be expected in about 30 per cent. of the operative cases. Sometimes when omentopexy fails, splenopexy succeeds. Drainage of the gall-bladder

[1] Annales Internationales de Chirurgie Gastro Intestinale, 1908, vol. ii, p. 196.

[2] Ibid., p. 192.

exerts a favorable influence in cases of hypertrophic cirrhosis. A complication of nephritis in cirrhosis is not a contra-indication to omentopexy.

Under certain circumstances *syphilis of the liver* may require operation. This leads Munro[1] to inquire what are the indications which make gumma a surgical disease. The gumma of adults may be single or multiple. It may be of any size from a pin-head up to that of an egg or larger. It may become cheesy or calcified or infected. If the inflammation extends to the peritoneum, there will be pain, tenderness, spasm, limitation in the movements of the liver during respiration, etc. There may be jaundice or ascites from pressure. If infection takes place, the symptoms may be very serious. In certain cases of gumma of the liver there has been such a rapid loss in weight as to lead to a diagnosis of malignant disease. Another symptom which may be due to gumma and which is often mistakenly interpreted is ascites. It is well also to remember that fever is a frequent accompaniment of gumma.

The differential diagnosis, it will therefore be seen, is often a difficult one to make, including, as it must, the cirrhoses, abdominal tuberculosis, malignancy, gallstones and cholecystitis, gastro-intestinal lesions, and the functional dyspepsias. Munro mentions four cases in which operation was performed with these carefully made pre-operative diagnoses: cholecystitis; suspected carcinoma; chronic intestinal obstruction; and cancer of the cecum. In all four there were found unsuspected gummata, in differing stages of recent and old inflammation, but none of the conditions was diagnosticated before operation.

Gallstones. When one considers the readiness with which concretions form about a foreign body in the urinary bladder, it is rather surprising how few cases have been reported of the formation of biliary calculi around sutures that have been placed in the gall-bladder. Florcken[2] mentions a case of a woman, aged twenty-seven years, who was operated upon for empyema of the gall-bladder. The operator removed from the organ 27 calculi, closed the opening by suture in part, drained the bladder with a soft catheter, and stitched it to the parietal wall. In four weeks the fistula closed spontaneously. In the succeeding years the patient suffered a good deal of pain, and five years later the inflamed and distended gall-bladder was excised. It contained two loose gallstones, and three others which had formed around threads still attached in the wall of the bladder (Fig. 47). It was the opinion of the operator that the free stones had been overlooked at the first operation. Similar cases have been reported by Kehr, Homans, Enderlen, and Ritter. Hansemann reports the occurrence of two calculi upon a silk thread in the duodenum, following resection of the pylorus. Chemically these calculi were gallstones, although they had never existed as stones in any

[1] New York State Journal of Medicine, 1908, vol. viii, p. 183.

[2] Deutsche Zeitschrift f. Chirurgie, 1908, vol. xciii, p. 310.

of the biliary passages. They were found at autopsy, seven months after the operation, so that they could not have been longer than this time in forming, and yet they measured about one-half inch in length.

The practical point in connection with this subject is to use catgut in the suture of the gall-bladder, or if silk is used, to leave the ends of the sutures long enough to protrude through the wound so that the sutures can be extracted.

Kehr[1] thus states his present attitude in regard to operations for gall-stones. He does not believe in early operation in all cases. An operation is absolutely necessary in acute and chronic empyema of the gall-bladder and chronic obstruction of the common bile duct. Patients

FIG. 47.—Gall-bladder laid open to show, *a*, *b*, and *c*, calculi formed around threads; *d* and *e*, free calculi.

suffering from colic to such an extent that their occupation is interfered with, or their pleasure in life is lessened, should also be operated upon. He disapproves of cholecystendysis, and prefers cholecystectomy to cholecystostomy. If the common duct is opened, it is better to drain it rather than to suture it. Mortality in uncomplicated cases is 2.3 per cent. If the disease compels at the same time an operation on the stomach, intestines, liver, or pancreas, mortality rises to 20 per cent. If there are malignant complications, the mortality is about 75 per cent. True recurrence is possible if the gall-bladder is left in position; it is extremely

[1] Annales Internationales de Chirurgie Gastro Intestinale, 1908, vol. ii. p. 187.

rare after removal of the gall-bladder combined with drainage of the hepatic duct.

Chronic Obstructive Jaundice. Lilienthal[1] believes that in chronic profound obstructive jaundice the proper procedure is to drain very gradually in order to avoid too sudden relief of hepatic tension, with its concurrent risk of hemorrhage. If the size and character of the gall-bladder permits, it should be utilized for the purpose, the opening into it being made very small. At a later date, when the condition of the patient has improved, a more radical operation, of whatever nature is indicated, can be performed under much more favorable chances of success. In performing a temporary cholecystostomy for the purpose indicated, care should be taken not to cause firm adhesions, which will render the second operation more difficult. Manipulation should be kept at a minimum and no gauze packing placed around the gall-bladder.

The risk following choledochotomy is probably less if the operation be performed in two stages. If there is an infectious cholangitis, the necessity of prompt relief makes immediate drainage imperative in most cases.

In non-infectious and acute (short of six weeks) icterus drainage by the natural channel into the bowel, with suture of the wound in the duct, promises a speedy cure without the annoyance of a biliary fistula and with far less liability to the formation of intraperitoneal adhesions with their subsequent dangers.

In brief, the scientific and judicious employment of preliminary drainage in obstructive jaundice will probably lessen the dangers of such steps as may be necessary for permanent cure. This drainage should form the sole object of the surgeon's work until the factor of cholemia has been eliminated. Radical operations should, in most chronic cases, be postponed until hepatic engorgement and icterus no longer exist.

THE PANCREAS.

Pancreatitis. Our knowledge of chronic inflammatory diseases of the pancreas may almost be said to date from 1896, when Riedel called attention to the association of chronic interstitial pancreatitis with the presence of gallstones; but it was not until Robson operated in 1900 that we obtained the modern conception of chronic pancreatitis. Increasing experience has served to show a very intimate relation between chronic and inflammatory conditions of the pancreas and *gallstones*. This leads Haggard[2] to remark that the only weak point in the defences of the pancreas is the use of the duodenal opening in common with the secretory duct of the liver. According to different writers, from 40 to 80 per cent. of cases of chronic interstitial pancreatitis are associated with gallstones.

[1] New York Medical Journal, 1907, vol. lxxxv, p. 924.

[2] Surgery, Gynecology, and Obstetrics, 1908, vol. vii, p. 613.

Probably in some cases in which no gallstone is found the damage to the pancreas may have been started by a temporary blocking of the common duct with a small stone which has later passed into the intestine. It is true that in some cases the duct of Santorini is able to relieve the pancreas when the duct of Wirsung is blocked (Fig. 48); but in one-half of the bodies examined by Opie the duct of Santorini was so contracted or

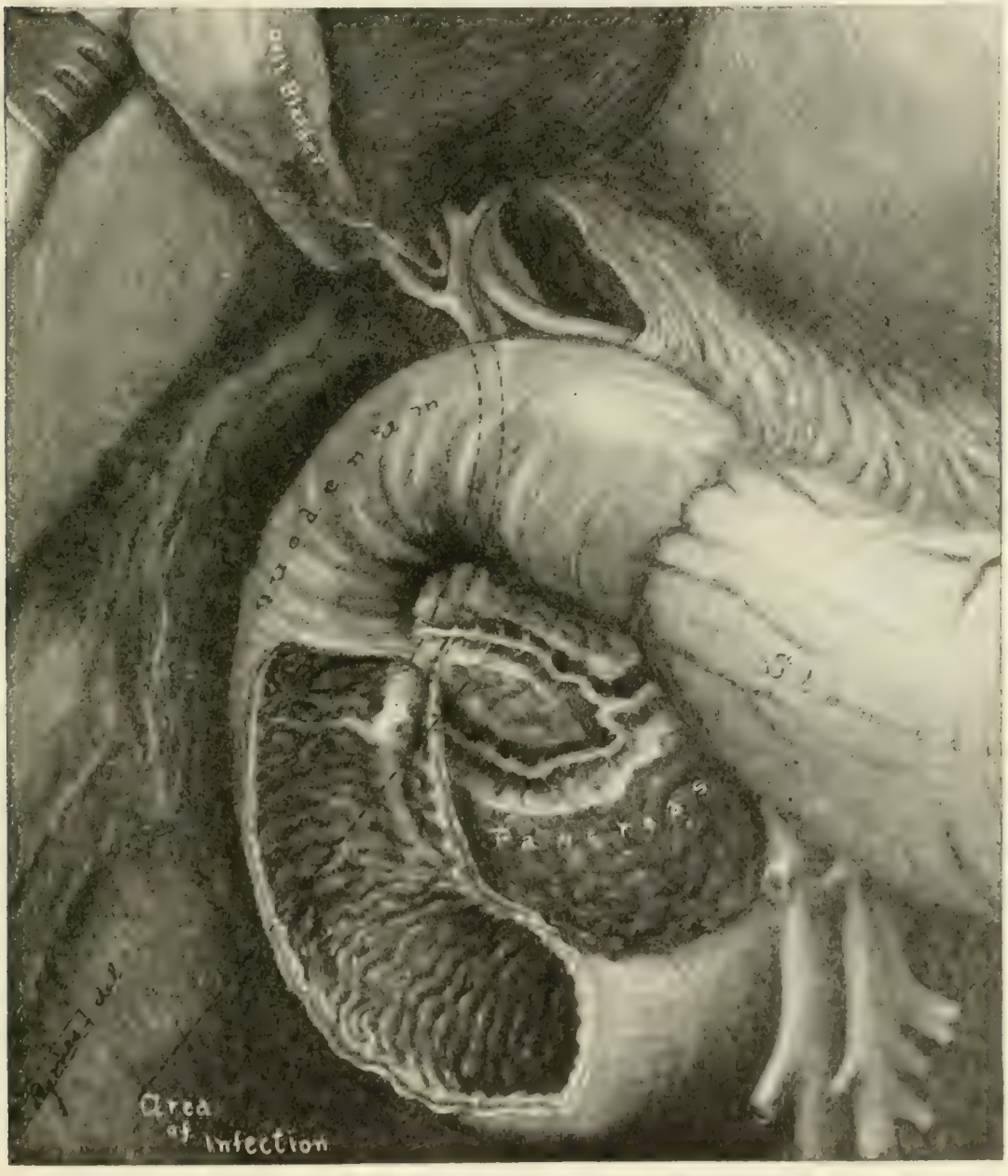

FIG. 48.—Showing relation of pancreas to stomach, duodenum, and bile ducts. The portion of the pancreas lying between the duct of Santorini and the duct of Wirsung is most likely to be involved in the infection, and is marked "area of infection." (Mayo.)

obliterated that it could not properly perform the function of the larger duct of Wirsung. When partial obstruction to the flow of pancreatic fluid exists, it is easy for infection to take place in the pancreatic ducts, the organisms being derived from the duodenum or from the bile ducts in cases of infection within them.

Maugaret, in an essay on inflammation of the pancreas, published in 1908, claims that the usual method of infection is not directly through the ducts, but through the lymphatics. The efferent lymphatics of the gall-bladder terminate in an important group of glands, in the region of the head of the pancreas. This same group receives the efferent lymphatics of the pancreas itself. The head of the pancreas is therefore situated in a lymphatic cross-roads, as it were.

Gallstones may thus be considered the most common single cause of pancreatitis. The next most important cause is inflammation of the stomach and duodenum. The swelling of the duodenal mucosa closing the ampulla of Vater is the mechanical explanation. Pancreatitis from *duodenal catarrh* is probably the most common cause of what is generally called catarrhal jaundice. To gastroduodenal inflammation may be attributed nearly one-third of the cases of pancreatitis.

Mumps is followed by pancreatitis in a certain number of cases. The attack is rarely fatal.

Ochsner, in speaking of the *diagnosis of pancreatitis* as a complication of cholecystitis, places reliance upon the following test: If there is a distinct tenderness at Mayo-Robson's point—that is, half-way between the end of the ninth rib and the umbilicus—and a second area of tenderness upon deep pressure at a point a little to the right of the umbilicus, and upward for a distance of two or three inches, a diagnosis of pancreatitis is fairly certain, provided duodenal ulcer can be excluded. Two symptoms of duodenal ulcer must be absent, (1) hyperchlorhydria with eructations, and (2) pain before meals when the stomach is empty.

While it is true that the cirrhosis of the pancreas often observed in operations for biliary calculus has usually been benefited or even cured by such operation, the conclusion has been perhaps too hastily drawn that all one needs to do to cure chronic pancreatitis is to treat the biliary condition. According to Vautrin,[1] chronic pancreatitis is not always secondary to biliary calculus, and it is not always cured by the relief of the latter.

Quenu and Duval collected reports of 62 operations performed for *chronic pancreatitis associated with cholelithiasis*. There were no less than 9 different operations, as follows:

	Cases.	Deaths.
Simple cholecystostomy	12	2
Simple choledochotomy	6	2
Duodenocholedochotomy	3	
Cholecystostomy with choledochotomy	18	2
Simple cholecystectomy	3	1
Cholecystectomy with choledochotomy	3	
Cholecystectomy with drainage of the hepatic duct	10	1
Cholecystendysis	1	
Cholecystenterostomy or cholecystogastrostomy	6	2

[1] Revue de Chirurgie, 1908, vol. xxxvii, p. 602.

All of these operations were directed against the biliary condition rather than the pancreatitis, and yet an improvement in the condition of the pancreas took place in all of them. In fact, Wlako went so far as to claim that an exploratory laparotomy caused the complete disappearance of the symptoms of pancreatitis. This is certainly a careless statement. There is, however, no manner of doubt that the relief of biliary calculus, especially if it is followed by biliary drainage, or the reëstablishment of the biliary flow, marks a regression in an infectious thickening of the pancreas.

Surgical Treatment of Pancreatitis. In determining what is the suitable operation for chronic pancreatitis, it is well to divide the cases into those which are associated with biliary lithiasis and those which are not so associated. In the first class of cases, success has usually followed either the drainage of the gall-bladder or of the common duct. This is more likely to follow a simple operation if the pancreatitis is in an early stage; whereas, in the more advanced stages drainage of the gall-bladder alone may be insufficient. If the biliary passages and the duct of Wirsung are simultaneously infected, there will be required drainage of the hepatic duct, continued for two or three weeks, combined with drainage of the subhepatic space; for this, even more than the biliary drainage, exerts a derivative favorable action upon the pancreas. Vautrin always loosens the duodenum and the posterior attachments of the pancreas, so as to make this subhepatic drainage very deep. In some cases the sclerotic tissue of the pancreas surrounds and constricts the common bile duct. In such cases, it must be divided in order to obtain the full benefit of drainage. In some advanced cases even such extensive operations fail to give relief, probably because the cirrhosis has gone on to a point beyond the possibility of restoration of function. In these advanced cases an anastomosis should be established between the biliary passages and the stomach or intestine, preferably the latter.

In the second class of cases, those in which chronic pancreatitis exists without biliary lithiasis, the infection is probably an ascending one from the intestine. In these cases the treatment recommended by Vautrin is mobilization of the duodenum, retroduodenal drainage, and possibly partial resection of the pancreas.

The treatment of pancreatitis, as carried out in Rehn's clinic, is thus summarized by Nötzel:[1]

1. Acute pancreatitis should be treated surgically as early as possible. Laparotomy, tamponade of the affected portion of the pancreas, combined with irrigation and drainage of the free peritoneal cavity, are the essentials of this treatment.

2. The operative procedure should be as short as possible, but the bile ducts should in every case be carefully examined.

[1] Beiträge f. klin. Chir., 1908, vol. lvii, p. 734.

3. If cholelithiasis exists, appropriate treatment should be carried out, including drainage of the gall-bladder.

4. If the condition of the patient does not permit at the time satisfactory treatment of the biliary passages, this should be carried out later.

5. Every patient who is operated upon for cholelithiasis should have his pancreas examined, even though he has had no symptoms of pancreatitis.

6. Whenever a laparotomy is performed for symptoms of acute peritonitis, and nothing is found in the peritoneal cavity to explain the symptoms, the gastrocolic ligament should be torn through and the pancreas examined. If pancreatitis exists, tamponade should be established.

Mayo[1] divides the surgical treatment of pancreatitis according as the patient is suffering from acute, subacute, or chronic inflammation. The patient suffering from *acute pancreatitis* exhibits all the symptoms of acute perforation in the abdomen. Mortality after operation is very high, but without operation it is still higher. If the patient is seen in the first forty-eight hours, an incision should be made in the median line above the umbilicus. There will be more or less bloody serum within the peritoneal cavity, and often disseminated areas of fat necrosis even at this early stage. The greatly swollen pancreas, dark from infiltration with blood, should be incised in several places. Hemorrhage can be controlled by gauze packing stitched in place by catgut. There should be free drainage through the anterior incision. If the biliary passages are infected, or contain stones, they should be drained through a right lateral incision if the patient's condition permits.

After forty-eight hours, operation still consists in affording free drainage. Some have advocated a posterior incision. Mayo prefers the anterior, as leading more directly to the head of the pancreas, a part of the organ which is most often involved.

In *subacute pancreatitis* the patient has survived the first attack, for experience has shown us that acute pancreatitis is by no means as uniformly fatal as was at first supposed. Mayo employs the same incision when operating during this stage, and through it drains pancreatic abscesses or collections of blood, or removes pancreatic calculi or gallstones from the common duct. Up to September, 1908, the Mayos reported 2611 operations upon the gall-bladder and bile tracts, the pancreas being involved 200 times, or 7.6 per cent. In 325 operations on the common and hepatic ducts the pancreas was involved in 22 per cent.

The removal of gallstones with temporary free drainage by means of cholecystostomy may usually be depended upon to cure *chronic pancreatitis*. The infection caused by the stones is readily relieved by this drainage, and in a comparatively short time the pancreatic pressure upon the common ducts disappears and a permanent cure ensues. In cases

[1] Surgery, Gynecology, and Obstetrics, 1908, vol. vii, p. 607.

of chronic pancreatitis without gallstones, simple cholecystostomy will not suffice, because the continuation of the pancreatic disease lies outside of the biliary tract. In these cases prolonged or permanent diversion of the bile from the pancreas should be obtained by means of cholecystenterostomy. For this reason it is very important not to remove the gall-bladder in cases of pancreatitis unless it is the seat of malignant disease, or unless it has lost its function through permanent obstruction of the cystic duct.

Mayo has seen five cases in which stones have formed in the common duct subsequent to removal of the gall-bladder. From these and other observations it appears probable that the gall-bladder has some functions, one of which is the production of mucus. Flexner has shown that bile which contains considerable mucus is much less liable to cause pancreatitis than pure bile. Another probable function of the gall-bladder is to relieve tension in the common duct.

From the fact that a number of Mayo's patients failed to make a good recovery because of pancreatic complications, he is convinced that the operation of cholecystenterostomy should be more frequently performed, especially in patients with a distended gall-bladder and a dilated common duct, with or without stones.

In performing an *anastomosis between the gall-bladder and the alimentary canal*, four sites have been employed, *i. e.*, the stomach, the duodenum, the jejunum, and the transverse colon. The duodenum should always be chosen when possible, since an anastomosis with it most nearly restores natural conditions. If this cannot be effected without too great traction, a loop of upper jejunum should be selected. For this purpose the transverse colon is pulled upward and to the right until the jejunum can be seen at its origin just at the left of the vertebral column. A loop from two to three feet in length is found that can easily be brought up over the transverse colon to the gall-bladder.

Union between the gall-bladder and the stomach has been advocated and practised by Kehr in some cases. It is certainly an easy operation, and if it can be shown that the free drainage of bile into the stomach is not harmful, it would have many advantages from a technical standpoint. The stomach is thick walled, has a large blood supply, and a certainty of union would be assured. In four cases Mayo has found a spontaneous opening between the gall-bladder and stomach, as a result of gallstone sloughing. In these cases operation proved that nearly if not quite all of the bile was being discharged into the stomach apparently without trouble.

Union between the gall-bladder and colon is theoretically unfavorable, because the bile is introduced so low down in the intestine, and because of the infection of the gall-bladder which may follow. In the few cases in which Mayo has performed this anastomosis, the patients have remained in excellent health, but the circumstances which make it necessary to choose this portion of the alimentary canal will rarely arise.

Mayo makes an anastomosis about one and one-fourth inches long in the same manner as a gastro-enterostomy, using catgut for the inner suture and linen for the outer one.

Pancreatectomy. Partial resection of the pancreas, the latest advance in the treatment of diseases of the pancreas, has been made the subject of a special article by Sauvé.[1]

It is generally admitted that total pancreatectomy is incompatible with life. Resection of the tail of the pancreas is not dangerous, but is rarely called for except as a result of injury. Resection of the head is dangerous, but is, none the less, possible, as shown by experiments upon animals and by a few operations upon man.

Surgically, the pancreas is composed of two portions of very different characters. The tail is intraperitoneal, movable, and easily operated upon, whereas the head is fixed by the posterior peritoneum and also by the curve of the duodenum around it. It is attached to the liver by the common duct, by the portal vein, and by the gastroduodenal artery, a branch of the hepatic artery. The attachment of the pancreas to the second portion of the duodenum is so complete that resection of the head of the pancreas also implies resection of this portion of the duodenum, which must in turn be followed by a gastro-enterostomy and by a cholecystenterostomy. This extensive resection is made possible by planes of fascia which pass in front of and behind the duodenum and pancreas; and in the cleft between these fascial planes are included not only these two organs, but also the portal vein, common bile duct, and lymph glands.

Now, primary *cancer of the pancreas* is almost always situated in the head. The tumor is rarely large. Its method of growth is by continuity rather than by metastasis. It involves the pylorus and duodenum. In a good many cases (37 out of 132 observed by Segre-Remo) the involved head was still movable, thus favoring its removal. The involved lymph glands form a chain along the lower margin of the head close to the superior mesenteric vessels; a second chain along the upper margin of the head leading to the common duct; and a third chain posterior to the head close to the great vessels, but separated from them by a layer of fascia.

The removal of these lymph glands affords difficulties; and it must also be recognized that there are adhesions in many cases, and that in some cases metastases form in the liver relatively early.

There are eleven resections of the head of the pancreas recorded by Sauvé.[2] They were not all cases of cancer. Seven of the patients survived, after operations performed by Ruggi, Sendler, Codivilla, Biondi, Tricomi, Franke, and Duval. These names must stand as pioneers in this new field of surgery. Three of the patients were in good health a

[1] Revue de Chirurgie, 1908, vol. xxxvii, p. 113.

[2] Ibid., p. 335.

year after operation, the pancreatectomy having been performed for tuberculosis, adenofibroma, and chronic pancreatitis secondary to perforating pyloric ulcer. The longest survival in the cases of carcinoma was about six months.

These results are certainly encouraging as showing a good beginning in what has been regarded as a field impossible to cultivate.

Technique of Pancreatectomy. To succeed in removing the head of the pancreas, an operator must avoid three things—injury to the portal vein; injury to the superior mesenteric vessels, which is followed by gangrene of the small intestine; injury to the right colic artery, which is followed by gangrene of a part of the colon.

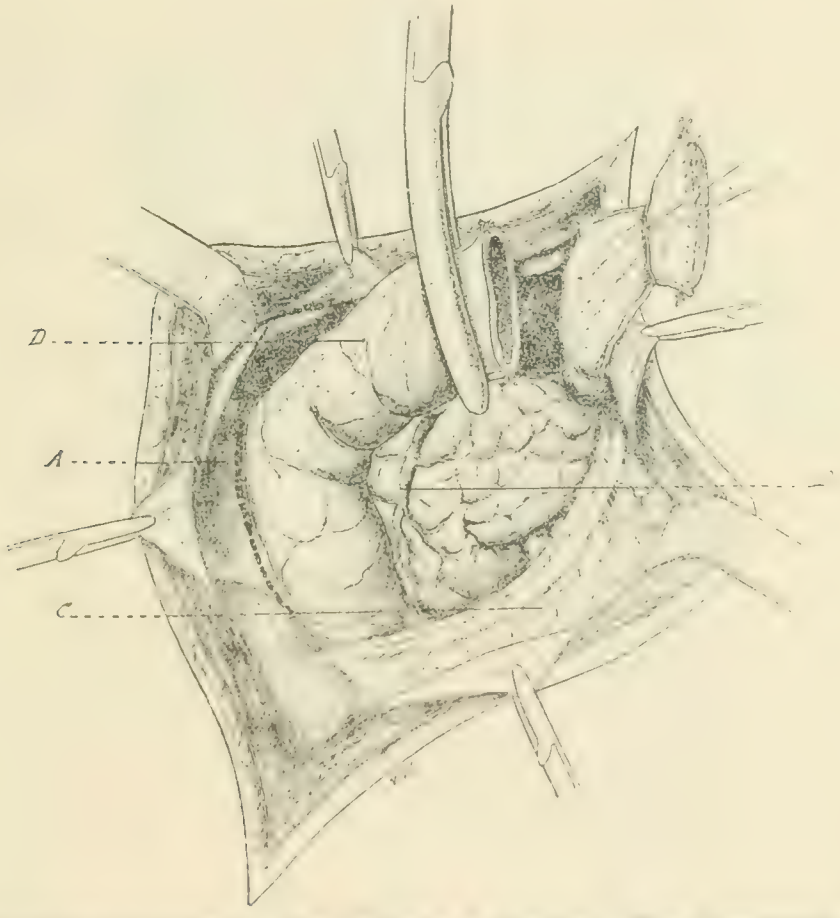

Fig. 49.—Pancreatectomy. The pylorus is divided. The duodenum is drawn forward by the clamp on its cut end. *A*, paraduodenal incision of Wiart; *B*, gastroduodenal artery; *C*, mesocolon; *D*, duodenum. (Sauvé.)

The following technique is advised:

1. A median incision from the ensiform to below the umbilicus. A bayonet incision gives a much better exposure than a linear incision of equal length.

2. Ligature of the pyloric artery, of the gastroduodenal artery, section of the pylorus, and suture of the gastric wound.

3. Division of the fascia along the right border of the duodenum; posterior dissection of the second portion of the duodenum and the head of the pancreas.

4. Section of the duodenum at a point sufficiently far from the superior mesenteric vessels to protect them from injury (Fig. 49). The dissection of the duodenum should be carried to a point at which it can be easily separated from the head of the pancreas, but not to the mesenteric vessels (Fig. 50). Ligation below of the pancreaticoduodenal vessels. Section of the duodenum and suture of its lower end.

5. Separation of the "lesser" pancreas from the mesenteric vessels which cross in front of this portion (Fig. 51). Separation of the pancreas from the portal vein.

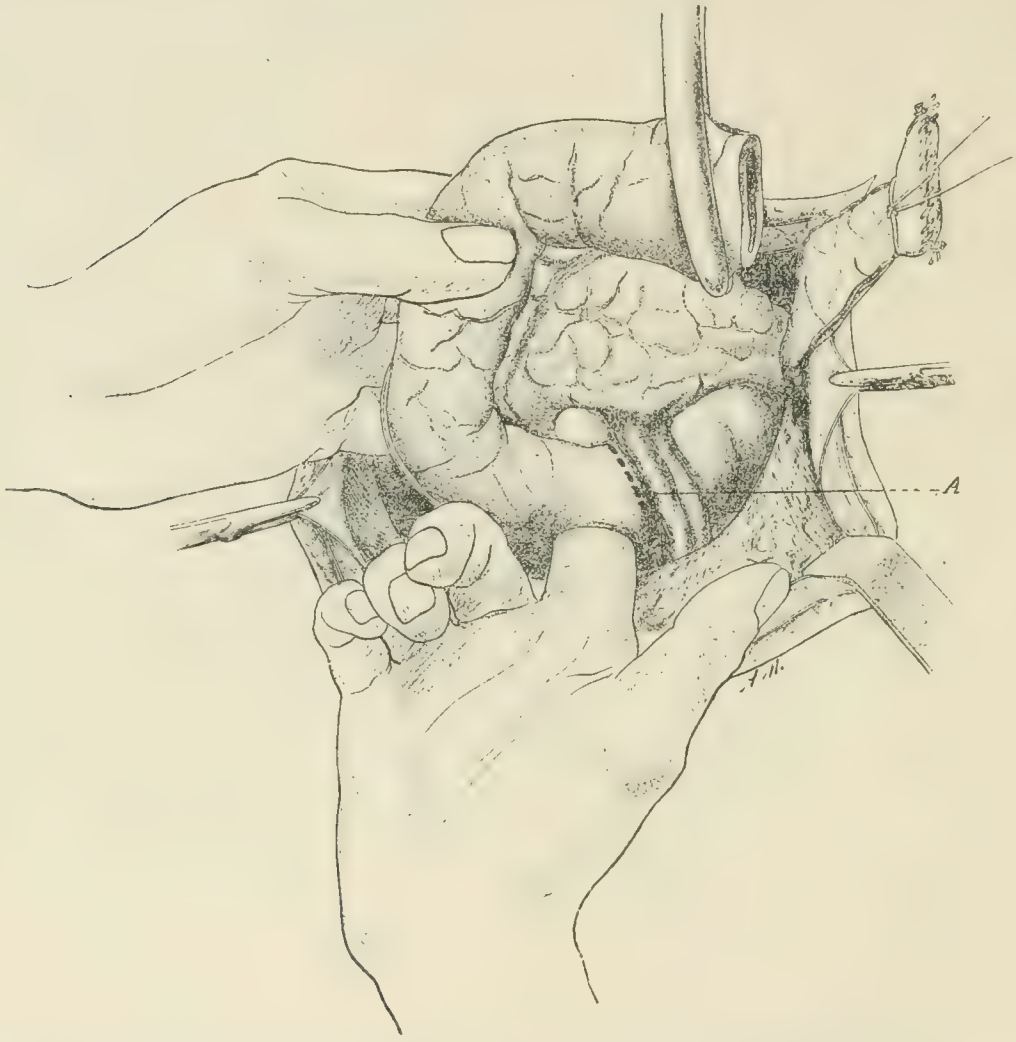

FIG. 50.—Separation of the duodenum to the point of section, indicated by the dotted line *A*. The mesenteric vessels cross it just beyond. (Sauvé.)

6. Section of the head of the pancreas. It is desirable to leave enough of the tail to bring the cut surface into the abdominal wound. The common duct remains to be ligated and divided, the gastroduodenal artery is ligated a second time for surety and divided, and the portions of the duodenum and pancreas are thus removed (Fig. 52). The exposed vessels are inspected to make sure they are uninjured.

There remain three necessary steps: (*a*) Reëstablishment of the alimentary canal; (*b*) reëstablishment of the biliary canal; (*c*) disposition of the tail of the pancreas.

(*a*) Gastro-enterostomy may be carried out as a preliminary operation, or it may be performed at the time of pancreatectomy. The former plan has some advantages.

(*b*) The biliary current may be restored by an anastomosis between the gall-bladder and stomach or intestine, or between the cut ends of the common duct and stomach or intestine. The latter plan is preferable but is seldom possible.

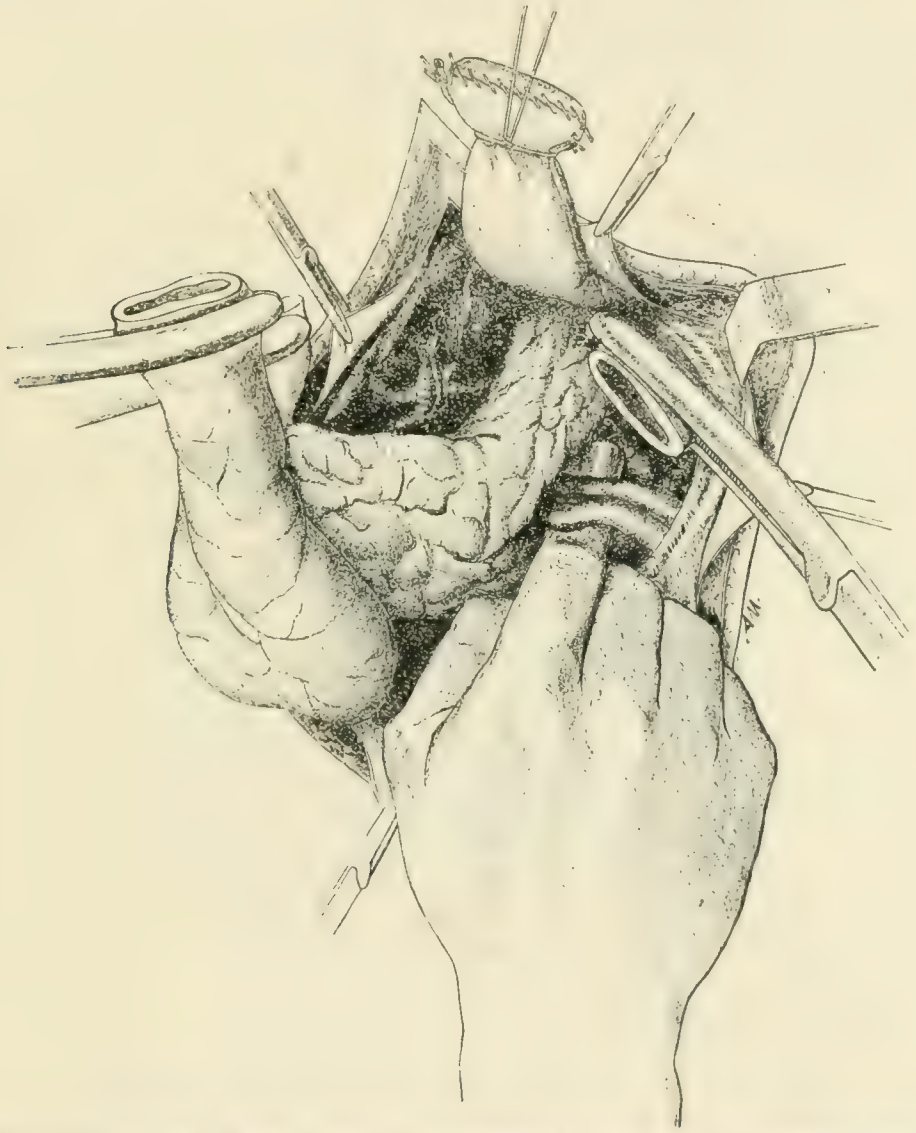

FIG. 51.—The index finger carefully separates the mesenteric vessels from the lesser lobe of the pancreas. (Sauvé.)

(*c*) The cut surface of the tail of the pancreas is stitched into the abdominal wound, making an external pancreatic fistula. This closes spontaneously in a few weeks in most cases.

To sum up this matter, one may say that the surgeon who sees a patient with cancer of the pancreas—not too far advanced—should perform exploratory laparotomy, and if the tumor seems removable he should perform gastro-enterostomy, preferably en Y. At a later day he should remove the head of the pancreas and part of the duodenum and perform choledochoenterostomy or cholecystenterostomy.

Rupture of Pancreas. In rupture of the pancreas the risk to life, aside from possible pulmonary complications, depends chiefly on hemorrhage and injury to the abdomen from extravasated pancreatic juice. In spite of these dangers most of those patients who have been promptly operated upon have recovered, provided that the rent was accessible to repair. Unoperated patients who die usually survive the accident from four to eight days and present before death the symptoms of vomiting, abdominal distention, and complete cessation of intestinal action, the same symptoms, in other words, that are found in pancreatitis. At autopsy the fat necrosis, injection of the peritoneum, and serohemorrhagic exudate show the destructive action of the pancreatic juice.

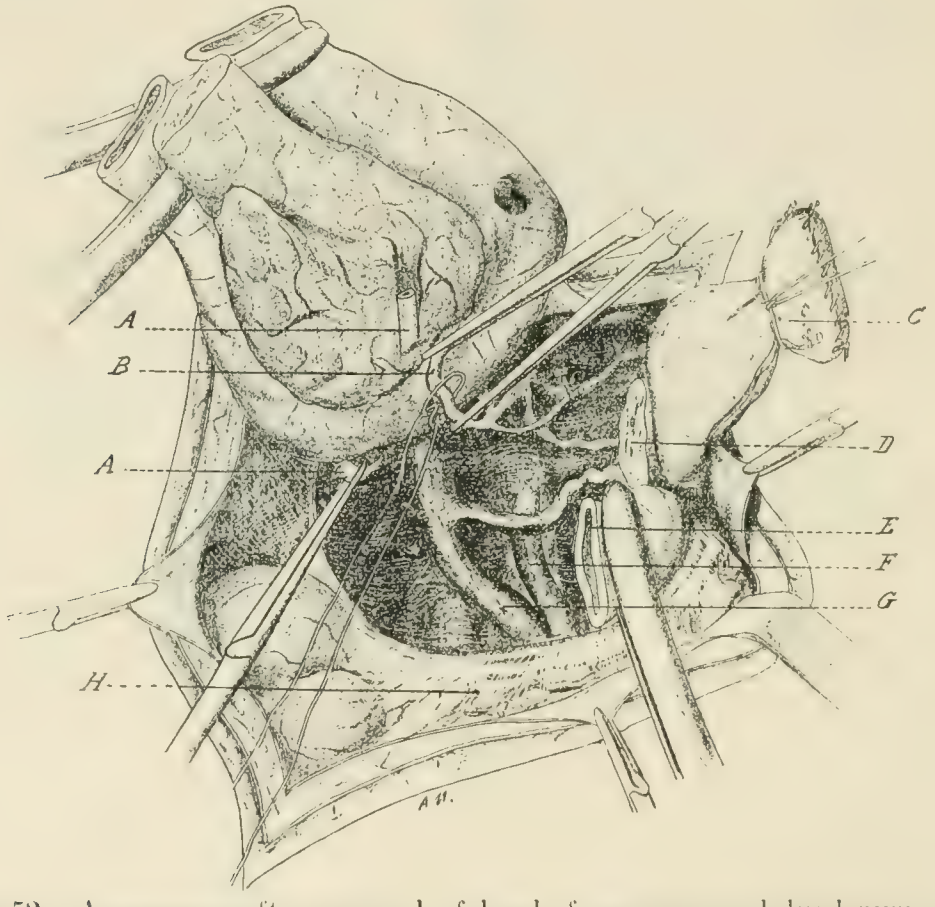

FIG. 52.—Appearance after removal of head of pancreas and duodenum: *A*, *A*, divided common duct; *B*, gastroduodenal artery; *C*, pyloric end of stomach; *D*, tail of pancreas; *E*, lower cut end of duodenum; *F*, *G*, superior mesenteric vessels; *H*, mesocolon. (Sauvé.)

Suture of the torn pancreas is undoubtedly better than tamponade. It lessens the escape of pancreatic juice, and at least favors the reëstablishment of the continuity of the ruptured ducts. An important point in the after treatment is the keeping of the diet free from carbohydrates in order to lessen the amount of the pancreatic juice. This was first suggested by Wohlgemuth-Karewski, and a number of surgeons who have followed the suggestion have reported good results from it.

GYNECOLOGY.

By JOHN G. CLARK, M.D.

Cancer of the Uterus. The study of cancer may be said, at the present time, to have settled into its stride. The premature assertions concerning a cancer parasite, the ingenious but preposterous theories relative to its origin and nature, the extravagant and ill-founded claims made for certain forms of treatment, have been replaced by a frank acknowledgment that we know little of its true nature, and that early diagnosis and prompt operation offer the best hope of relief.

Not that there is any abatement in cancer research—it has come to stay until the problem is solved—but more investigators are content to record single facts without fashioning new theories to fit them.

The *British Medical Journal*[1] speaks of the formation of the International Association for Cancer Research. Its object is to promote the investigation of cancer, consider methods of treatment, collect statistics, and establish in Berlin a central bureau of information on everything which relates to cancer.

The same publication[2] notes also that the founder of the Caird Cancer Pavilion of the Dundee Royal Infirmary has offered the sum of £1000 a year, for a period of five years, for the purpose of prosecuting researches into the nature, cause, prevention, cure, and treatment of cancerous disease.

Another editorial article[3] draws attention to the founding of an American Association for Cancer Research. The first laboratory exclusively devoted to cancer research was in America, and the suggestion for a recent successful International Congress, held in Heidelberg, was made by an American. The membership of the society is composed largely of laboratory investigators, but it is the intention of the founders to broaden and expand its scope.

A report of the first meeting, held in New York, November 15, 1907, appears in the *Journal of the American Medical Association*, vol. 1, No. 1. Investigations were reported by Crile, Gaylord, Weil, Ewing, Beebe, Coley, Loeb, and Flexner.

Ewing[4] has written a most admirable review on the present status

[1] January to June, 1908, vol. i.

[2] British Medical Journal, February 22, 1908, vol. i, p. 475.

[3] Journal of the American Medical Association.

[4] Archives of Internal Medicine, February 15, 1908, vol. i, No. 2, p. 175.

of cancer research. He states that today cancer research includes three separate departments, the first having to do with the parasitic theory, the second, with the theory of cell autonomy, and the third, with the modern biological and biochemical study of tumors. He reviews many of the papers which I have presented in PROGRESSIVE MEDICINE during the last few years.

He says that if there is any general criticism of the recent trend of cancer research it must apply to the exclusive relation of these studies to the nature of the *established* tumor process and their failure to deal with the *origin* of tumors. These problems seem to be entirely distinct. From this standpoint the more fundamental character and permanent value of the long line of studies on cell autonomy become conspicuous, for these deal with the origin of tumors.

He is strongly of the opinion that information of fundamental importance in this field is still to be obtained by the very minute observation and analysis of the general and local conditions surrounding the early stages of cancer. This is the exclusive opportunity of the clinician—medical, surgical, and special—but it is often neglected. In it lies the chief hope, for the present generation, of a reduction in the mortality from cancer by the earlier recognition of the precancerous stage and the elimination of some of its accessible factors.

The recent studies of artificial immunity to tumors in the lower animals touch closely on the problem of the control of tumor growth in man, but the highly artificial conditions which form the basis of these experimental studies may cause disappointment when an effort is made to reproduce in man the results secured in the lower animals. Yet the situation is encouraging, and the present fixed determination to acquire more facts in the experimental field is truly epoch-making. Cancer research now may be stimulated justly more than ever before by the reflection that a vast practical importance may at any moment attach to the new facts that are being gathered.

ETIOLOGY. There is nothing new, but much that is vague, in the idea of Wyss,[1] that cancer is produced by the proliferation of epithelial cells over which the body has lost control. What part heredity plays is discussed by Williams.[2] In a note on "Heredity in Cancer" he points out that the proportion of women with cancer of the breast among whose relatives there was a history of cancer has been estimated by Butlin at 37 per cent., by Nunn at 29.3 per cent., by Leaf at 23 per cent., and by himself at 24.2 per cent.

He believes that whenever inquiries of this kind are made in a careful and systematic manner, the proportion of relatives affected will always be found to vary within these limits or in close approximation thereto.

Bashford[3] examined the histories of 2932 cases of cancer to determine

[1] Deut. Zeit. f. Chir., July, vol. xciii, No. 6.

[2] British Medical Journal, May 9, 1908, vol. i, p. 1152.

[3] Lancet, November 21, p. 1508.

the frequency of an *hereditary predisposition* to the disease. In 2263 of the cases, the conclusions in this respect were doubtful or the history had been carelessly taken. In 358 cases the history was good, but there had been no family cancer. In 311 cases, cancer had occurred in one to four blood relatives.

Borrel[1] thinks that everything in the life history of mouse tumors suggests a contagious origin, and Lejars,[2] who attaches much importance to "cancer houses" and cancer districts, is inclined to believe in the parasitic origin.

Leeson,[3] on the other hand, concluded that there was no such thing as a "cancer house" in his district, all but 4 of 248 cases which he studied occurring in different houses. He might have found, if he had been willing to accept the evidence, several "apoplexy houses," and he has little doubt there were "liver houses" in considerable number. There was no increase in the death rate from cancer.

Dudley,[4] in an article on "The Prevalence of Cancer in the Philippine Islands," shows that the more or less common belief that cancer is either very rare or does not exist at all in tropical and subtropical countries is not borne out by facts.

A reason which has been given for the non-existence of cancer in the countries mentioned is the vegetable diet of the inhabitants. The Filipino is not a vegetarian by choice, but by necessity. His consumption of meat is only limited by his ability to buy it. The majority practically never taste meat. The middle class eat a limited amount of native pork, while the wealthy class in large cities consume as much as other people. There was a great improvement in the general well-being of the poor native when changed from his accustomed diet to the more substantial one with a reasonable meat component, issued by the United States Army.

The author quotes the following statistics taken from McDill's clinic at Manila:

In two years and eight months, among 4284 patients admitted to the wards, 48 had cancer and 17 sarcoma. In 5668 cases treated at the dispensary, 11 cases of cancer are recorded. The Board of Health statistics of the City of Manila for the year 1907 show 64 deaths from cancer. The total number of deaths for all causes during the year was 7613.

Cancer of the cervix leads in frequency. Cancer of the stomach seems considerably less common than in other parts of the world, and this may be explained by the bland, unirritating nature of the Filipino's diet and by the fact that the drink habit practically does not exist.

[1] Revue de Médecine, July, xxviii, No. 7.

[2] Semaine Médicale, September 30, No. 40.

[3] Practitioner, February, p. 256.

[4] Journal of the American Medical Association, May 23, 1908, vol. l, No. 21, p. 1663.

Cancer of the buccal cavity and tongue is often met, and is thought to be due in large measure to the irritating effects of chewing "buyo," a composition which is generally used. "Buyo" is composed of a piece of nut called "bonga" and lime made from shells, and both are wrapped in a leaf taken from a tree called the "Betel" (*piper betle*). The general belief is that no greater damage results to the chewer than the coloring of the teeth, which are permanently stained a reddish brown.

But one case of cancer of the lips was admitted to the hospital. No other cases have been heard of. The native does not use a pipe, but confines his smoking almost exclusively to cigarettes.

The author quotes the statements of several observers, giving reasons for the non-occurrence of cancer of various sorts in native women of Hindostan. All of these reasons would apply equally to Filipino women, and yet the disease is as common in her as in women of the United States.

The majority of the cases come to the surgeon too late for operation.

It is difficult to get accurate statistics showing the true frequency of cancer in the Philippines. The apparent rarity shown in most reports may be attributed to the aversion to hospital treatment—it being considered a family disgrace—and to the numbers of incompetent physicians and "quacks."

Dudley believes that cancer exists really to a greater extent in the Philippines than in the United States.

The inoculation of cancer from one mouse to another is of course suggestive of a contagious nature, and Calkins[1] says that the rhythms of infectivity of cancer appearing as they do in successive batches of mice, legitimately assumed to have like powers of resistance, must find their cause in the cancer cell itself. The cell, therefore, must be equivalent to a parasite, or else a parasite is contained within or associated with it.

Upon any other hypothesis it is difficult to conceive of a cell creating a continual stimulus to its own growth energy, and it is still more difficult to explain the rhythms of infectivity.

Many lines of evidence point to the presence of some possible organism within the cancer cell; some organism which, acting as does *plasmodiophora brassicæ* within the vegetable cell, underlies the infectivity of the cancer cell and provides the stimulus for its continued proliferation. Upon such an assumption the numerous cases of cage infection find their explanation.

The various inclusions of the cancer cell which have been described as organisms have been disproved; yet the analogy of club root and the many filter experiments show that the cause of infection may lie within the cancer cell. It is conceivable that, like the yellow fever organism, such an incitant may be in the protoplasm and beyond our powers with the microscope to locate.

[1] Journal of Experimental Medicine, May 1, 1908, vol. x, No. 3, p. 283.

The spirochetes which we have found in mouse cancer may have something to do with this infectivity of the cancer cell. They may be useful in preparing the "soil" in new mouse hosts and making it susceptible to cell growth; or they may have intracellular stages in their life history which are too minute to be seen. The rhythms of infectivity, finally, may be expressions of the vitality of the spirochetes or of the hypothetical ultramicroscopic organisms accompanying the cancer cell.

Some interesting observations concerning the same problem have been made by Salvin-Moore and Walker.[1] They note that so far as it can be ascertained, the new tumor in inoculated mice appears to proceed directly from the cells belonging to the original tumor which have been mechanically transferred. The grafted tumor, in fact, apparently arises from the implanted cells and not through any alteration of the tissue of the new host which surround the graft.

For purposes of investigation portions of these tumors were removed from mice and subjected, for periods of from twenty minutes to one-half hour, to the *action of liquid air.* They were then at once introduced into healthy mice beneath the skin, the presumption being that under these circumstances the tumor cells would be destroyed by the action of the liquid air, and consequently that they would multiply no farther. However, among the inoculations made with the frozen material it was found that in some cases new tumors were produced. Further, in a number of mice wherein tumors of the same strain were already growing, similar inoculations were made in a remote part of the body; in some of these also the same positive result was obtained. From such observations it is rendered clear that exposure to liquid air at a temperature of about minus 195° F. does not necessarily destroy the potentiality of a mouse tumor to reproduce itself.

The facts in themselves are somewhat surprising, and they immediately raise a number of questions which it will be desirable to have elucidated in the interests of research concerning the nature of cancer. In the first place, it is rendered clear that exposure to liquid air for a certain period of time does not destroy the principle upon which the vitality of mouse cancer depends. If, as may be the case, the cells composing the mass of the tumor, and constituting the grafts, are killed by exposure to liquid air, then the development of mouse cancer after such exposure indicates not merely that the growth of similar tumors is independent of the integrity of the "cancer cell," but also that the new tissues are not necessarily formed from the implanted cells at all, and may arise from the cells of the new host in response to some stimulus introduced along with the frozen material, and quite independent of the integrity of the so-called "cancer cell."

[1] Lancet, January 25, 1908, vol. i, p. 227.

This matter is at present engaging their attention, but the fact that the capacity for originating newgrowths is not necessarily destroyed in the substance of tumors after exposure to liquid air, certainly suggests that the production of new tumors in the hosts into which the frozen cancer tissue has been introduced may possibly not be dependent upon the introduction of the "cancer cell" at all, but upon the action of a virus which is independent of the cell, and retains its activity after being subjected to the temperature of liquid air. It is well known that a number of bacteria are not killed by this temperature. The fact that cancer can be originated in mice by the implantation of portions of frozen tumors may indicate that there exists some such cause as an organized irritant or parasite acting as an agent in the production of cancer. On the other hand, however, it is not yet certain that the cells from the tumor introduced into a new individual are killed by half an hour's exposure to the temperature of liquid air, particularly as the seeds of some plants and trypanosomes are said to survive this temperature.

A similar line of experiments have been recorded by Gaylord.[1] A rapidly growing cancer of the mouse which was giving a high percentage of inoculations was divided into three portions. The first portion was frozen forty minutes, then injected into nine susceptible mice. The second portion was frozen for one hour and twenty minutes and injected into fourteen white mice, and the third, without freezing as control, was injected into five susceptible mice.

In the first lot two tumors developed; in the second three appeared, and in the five control mice rapidly growing tumors developed in each instance. For the purpose of determining the resistance of trypanosomes to freezing, he used the spleen of rats infected with Trypanosoma gambiense.

This organism has a degree of virulence which kills normal animals in three days. The experiments showed that the organism can withstand freezing for a period of twenty minutes, although its virulence is somewhat injured, the animals inoculated dying on the sixth and ninth days respectively after inoculations, whereas both the controls died on the third day.

Animals inoculated after freezing the organism forty and eighty minutes respectively remained uninfected, the trypanosome evidently being killed by exposure to freezing for those periods.

To study the resisting power of the growing epithelium he employed the tissues of young mice embryos removed aseptically, and after freezing twenty, forty, and eighty minutes, the material was injected into mice with suitable direct controls. None of the embryonic tissue which had been frozen grew, it being incapable, apparently, of withstanding the low temperature developed by liquid air.

[1] Journal of Infectious Diseases, October 20, 1908, vol. v, No. 4, p. 443

Apropos of these experiments, an editorial,[1] "Resistance of Tumor Cells, Embryonic Tissue, and Organisms to Freezing," remarks: "It is well known that many bacteria are not killed by exposure to the temperature of liquid air for considerable periods of time. Gaylord shows, too, that Trypanosoma gambiense is more resistant to low temperatures than embryonic epithelium, not being killed by exposure to a temperature of liquid air for twenty minutes; forty minutes' exposure, however, is fatal. These facts would seem to suggest that the cause of tumors may be more closely associated with the presence of some form of infection than with purely proliferative or embryonic processes; but at the same time it should not escape consideration that the tumor cells of themselves may be more resistant to cold than normal embryonal cells. The facts cited, while interesting and important, are not sufficient to force us to adopt a microbic theory of cancer. Indeed, it is not a bit stranger that tumor cells should survive freezing than that certain bacteria and trypanosomes do so."

Bonney[2] observes that the onset of the ordinary forms of carcinoma is always preceded by a condition characterized by epithelial hypertrophy and certain constant changes in the subepithelial tissue. This *precarcinomatous state* may be attained through various inflammatory processes, at first quite distinct from one another, but culminating in the same histological picture. The tissue-cell proliferation occurring around a primary carcinoma is a part of the precarcinomatous process and materially assists the progress of the growth. There is no histological evidence of a protective reaction on the part of the tissues to the carcinoma cell. Though changes in the adjoining connective tissue bear some very close relation to the cause of epithelial ingrowth, yet malignancy having been established, the further spread of the tumor is independent of such assistance.

Immunity. One of the promising fields in cancer research among the lower animals is that relating to immunity. Immunity may be natural or acquired. Loeb and Leopold,[3] in summarizing the results obtained in regard to the inoculability of tumors, state that there must be present for successful transplantation at least two conditions: first, a stimulus to grow, localized in the tumor cells themselves, and second, the presence of substances permitting the life of the transplanted cells in the new host. There is perhaps also another substance necessary which favors the growth of tumor cells. The necessity for the presence of such a third substance might depend on the strength of the stimulus to grow which exists in the tumor itself.

According to their inoculability, tumors may be divided into four groups: (1) Lymphosarcoma of dogs which possesses the widest range

[1] Journal of the American Medical Association, vol. li, No. 20, p. 1701.

[2] Lancet, May 16, 1908, vol. i, p. 1389; May 23, p. 1465; May 30, p. 1535, 1541.

[3] Journal of Medical Research, October, 1907, to February, 1908, vol. xvii, p. 299

of inoculability so far shown. It is transplantable not only to the dog, but to other species, like the fox. (2) Sarcoma of white rats and adenocarcinoma of white mice, which may be transplanted into white rats and white mice respectively, but also, although with much greater difficulty, into hybrids between white and gray (wild) rats in the case of sarcoma, and between white mice and gray mice in the case of adenocarcinoma. A third class of tumors such as the adenocarcinoma of the Japanese mouse is transplantable into other Japanese mice, but not into white mice. The fourth group of tumors, and it includes probably the largest number, comprises all of those which under ordinary conditions cannot be inoculated into other animals of the same species. This class includes the greater number of tumors of the lower animals.

It may be concluded that many of the tumors in man can be inoculated only into the same individual in which the original tumor was developed.

Crile and Beebe[1] have been conducting some experiments relating to the immunity subsequent to the spontaneous recovery from implanted tumors. The fact that transplantable mouse tumors retrogress spontaneously in a certain percentage of cases, and that, as a result, there exists in these animals an immunity sufficient to protect them from a further inoculation of like virulence is accepted everywhere as one of the foundation principles in cancer investigation.

The demonstration by Gaylord and Clowes that the serum of the immune animal had an injurious effect upon tumor cells, and that in some instances it seemed to aid in the inhibition of a growth already implanted, led them to try the effect of a direct transfusion of the whole blood of a spontaneously recovered and therefore immune animal to an animal with actively growing tumors.

The experiments forming the basis of their report were made upon a series of dogs affected with a transplantable lymphosarcoma. There is some difference of opinion as to whether this is a real tumor. Some investigators believe that it is an infectious granuloma. The authors are convinced that the process is a true tumor. They answer the arguments of Bashford, Murray, and Cramer, and, while acknowledging the fact that the process might appear infectious because it is transmitted by coitus, believe that the tumor in the course of nature has been subjected to repeated transplantation in such a manner and through such a series of susceptible hosts that its virulence has been raised, and, as would be expected, it is more readily transferred than tumors which have not had such a history.

The second argument that the new tumor develops from the surrounding connective-tissue cells of the host and not from the transplanted pieces of tumor is answered as follows: When a graft of the freshly cut tumor is implanted subcutaneously in a new host, the larger portion

[1] Journal of Medical Research, June, 1908, No. 3, vol. xviii, p. 385.

of the graft necroses, but there remains a layer of living cells about the periphery of the piece, sharply separated in many cases from the tissue of the host. It is from these cells that the new tumor develops.

A statement that the process is identical with those which follow the injection of tubercle bacilli is refuted by the fact that the new tumor grows directly from the transplanted cells.

Although the tumors are not found often in older animals, its more frequent occurrence in young sexually active animals is explained by the method of transmission. It is also a well-recognized clinical observation that sarcoma is more common in young individuals. Many older animals, however, show the tumor, and in a majority of instances it pursues a more malignant course.

Ten tumor animals were treated by the direct transfusion of blood from spontaneously recovered animals. Seven were completely cured; in two of the remaining there was a very marked effect from the transfusion, and only one died without showing any regression as a result of the exchange of the blood.

The authors believe that until more is known of the nature of immunity to tumors it can only be said that the blood of an immune dog apparently contains some substance of sufficient potency to influence the course of a tumor growth which is exposed to its action. It does this perhaps by stimulating the general nutritive processes, for improvement in the general physical condition is noted after transfusion.

It is also a fact that the blood of the tumor animal is hemolytic and perhaps generally toxic, so that the removal of such an injurious circulating medium and its replacement by the blood of a vigorous animal may possibly stimulate the latent defences of the tumor subject.

On the basis of so few experiments the authors were unable to decide positively the relative value of blood from normal animals as compared with that of spontaneously recovered animals. Their impression is that the blood from the recovered animal is somewhat better than the normal blood, but the quantity of the transfusion as well as its quality are of value in determining the outcome.

Apropos of the latest paper, an editorial,[1] "The Healing of Experimental Tumors by Transfusion of Blood," observes: "These results were much the same whether the immunity of the dog furnishing the blood was evidenced by an insusceptibility to inoculation with tumors or was an acquired immunity manifesting itself by spontaneous retrogression of tumors that had been growing for a time. The authors consider that immunity to tumors is not strictly analogous to bacterial immunity. Nevertheless, their results show that it is to some extent a blood condition which may be transferred to another animal, rendering it passively immune.

[1] Journal of the American Medical Association, vol. li, No. 3, p. 229.

"Interesting and suggestive as these experiments are, Crile and Beebe wisely refrain from any premature speculation as to their application to the treatment of human tumors, a subject that must be first approached only after a more extensive experience with animals has been obtained."

Diagnosis of Cancer. I have repeatedly dwelt upon the importance of an early diagnosis of cancer, and it is very generally recognized that unless the disease is discovered in an early stage it is practically incurable. Lockyer[1] reports that the British Medical Association, in July, 1907, passed unanimously the following resolution: "That the Council of the British Medical Association be requested to appoint a committee to consider the best means of disseminating knowledge of the importance of the early recognition of *uterine cancer.*"

A considerable amount of investigation has been recently undertaken to develop a reaction which might be indicative of cancer, even in its earliest stage. The test which has aroused the most interest concerns the *hemolytic reaction of the blood serum.* Fischel[2] relates that Kelling, in 1906, at the meeting of the Thirty-fifth Congress of the German Surgical Society, read a paper on this subject, elaborating his theory of the parasitism of foreign cells as the cause of human cancer, and taking the position that in the blood serum of many cancer patients there was a specific hemolytic action against the blood corpuscles of the lower animals. Kelling thought he had discovered the best way to diagnose cancer, and also the cause of cancer.

He found that the blood serum from cancer patients had a much more marked hemolytic action against the blood corpuscles of the chicken, the cow, the sheep, and the pig than the blood serum from undiseased individuals. Aside from malignant tumors, he found a positive reaction in two cases of pernicious anemia and in one case of leukemia.

Von Dungern opposed Kelling's theoretical and practical deductions. Kelling replied that he had made 600 tests up to 1907. In 265 cancer patients there had been a positive reaction in 119 (43.4 per cent.), in 320 non-carcinomatous cases the reaction occurred but 11 times.

A clinical case suggested to Crile[3] that the hemolytic property of cancer blood might be an aid to the diagnosis of cancer. He[4] describes the nature of hemolysis as follows:

The red corpuscle is covered by an exceedingly thin and delicate membrane, which prevents the escape of its contents, the most important being hemoglobin. This investing membrane is very susceptible to chemical or thermal changes in its environment. If impaired by such changes a part or all of the hemoglobin will escape and become freely

[1] Medical Press, February 12, 1908.

[2] Berl. klin. Woch., May 4, 1908, No. 18, p. 882.

[3] British Medical Record, June 6, 1908, vol. lxxiii, No. 1, p. 929.

[4] Journal of the American Medical Association, December 12, 1908, vol. li, No. 24, p. 2036.

diffused in the serum. The corpuscles then become proportionately paler, and if all the hemoglobin is lost there will remain only the framework of the cell, which is designated as a "shadow cell" or a "ghost."

Free hemoglobin may be detected in the urine and other secretions. If in quantity, it stains all the tissues, causing a brilliant jaundice. This process is known as hemolysis and the agents causing hemolysis are known as hemolysins. Hemolysins may be roughly classified as inorganic and organic. Among inorganic hemolysins are ammonia, soaps, ether—any agent that will change the isotonicity of the blood serum. Among organic hemolysins are normal tissue juices and blood of alien species, and the tissue juices and the blood in certain pathological states.

The hemolytic test for cancer depends on whether the blood serum of a cancer patient hemolyzes normal red blood corpuscles, and if so, whether the reaction is constant and peculiar to malignant disease.

Crile has experimented with this reaction quite extensively, and gives his technique in detail. During the course of his experimentation it has been greatly improved and now seems to be quite accurate. It is exacting, it must be precisely done, and every step must be amply surrounded by checks and controls. He says that his study was directed principally toward the hemolytic reaction in the normal state, in malignant tumors, in benign tumors, in pyogenic infections, and in tuberculosis.

In 211 normal individuals there was no hemolysis. Among 153 patients with cancer, 82 per cent. showed hemolysis, while 55 with benign tumors showed no reaction. In 11 postoperative cancer cases with clinical recurrences there was 100 per cent. hemolysis; in 37 cancer cases without clinical recurrence, three weeks to fifteen years after operation there was no hemolysis; the cancer cases showing no hemolysis were mostly in the advanced inoperable stage. Only an occasional early case failed to show hemolysis. Cancers on mucous membranes showed hemolysis more frequently than cancer in tissue, as the breast.

All cases of *tuberculosis* showed reverse hemolysis, that is, normal serum hemolyzed the patient's corpuscles. There was, therefore, a much greater autolysis than hemolysis, thus giving a characteristic reaction.

There were 9 instances of hemolysis in miscellaneous cases; 2 eclampsia, 1 in hyperpyrexia due to hyperthyroidism, 1 case of leukoplakia, 1 in psoriasis. The other 4 occurred in chronic disease without definite diagnosis. There were altogether 591 cases studied.

In chronic suppurations and acute infections no hemolysis occurred.

Hemolytic tests of the extracts of cancers and benign tumors were also made. Crile was able to corroborate Beebe's observations that the extract from cancer tissue caused active hemolysis, while the extract from benign tumors showed no hemolysis. This suggests the origin of hemolysins in the blood of cancer cases.

In all cases serum heated to 55° C. for ten minutes prevented hemolysis. Sudden chilling of the blood according to the method of Hoover and Stone caused a marked increase in the hemolytic action. Plasma obtained by immediate centrifugalization of serum caused little or no hemolysis in hemolytic cases, the hemolytic property reaching its maximum about twenty-four hours after the blood was drawn.

The cancer cases in which the disease was entirely removed lost their hemolytic property within twelve to twenty-one days of the operation. When an incomplete operation had been performed the hemolysins continued indefinitely. Of the 20 per cent. of cancer cases that did not show hemolysis, all but 1 of the first 80 were either inoperable or very advanced. There was but 1 negative reaction in an early case. In the cases of suspected cancer giving negative tests the chances have been twenty to one that they were either in a late stage or non-malignant. Cured cases showed no hemolysis.

No hemolysis, then, has been observed in normal individuals, in the victims of benign tumors, or in those the subjects of pyogenic infection. Hemolysis occurred in 82 per cent. of cancer cases, and in a considerable percentage of tuberculous cases which can be differentiated by the autolytic reaction.

Crile mentions 6 clinical instances in which the test indicated or disproved the diagnosis of cancer correctly, although he says that in its present state of development the hemolytic reaction for malignancy is not specific. It may be a valuable aid in diagnosis, and has more than once been the only positive evidence. The entire subject is a promising field for investigation.

The limit of resources for early diagnosis and operation, even in internal cancer, has by no means been reached.

Fischel,[1] at the instigation of Senator, made 17 examinations in a series of 11 patients. Of three cases of cancer, a positive reaction was obtained in two. In one case of sarcoma the reaction was negative (50 per cent. positive). In one case of diabetes mellitus he found a very strong reaction. Two tests were made with the same result. The patient had a very marked case and was in a very cachectic condition, so that the possibility of cancer of the pancreas could not be excluded. In two cases of pernicious anemia the reaction was positive. In two cases of severe pulmonary tuberculosis one was strongly positive, the other was negative. In one case of chronic heart disease the reaction was positive. In one case of chronic nephritis the reaction was negative.

As a result of his examinations, the author concludes that although in many cases of malignant tumor the blood serum exhibits a hemolytic action upon the blood corpuscles of different animals it is not specific for the blood corpuscles of one species of animals, and that hemolytic

[1] Loc. cit.

reaction is not peculiar to the malignant tumors. It occurs in other diseases also, especially in pernicious anemia and tuberculosis.

Weil,[1] after giving a brief survey of the work done during the last twelve months on the subject of hemolysis in cases of human cancer, speaks of the importance of the subject, in its application to human disease, which has been given to it by Crile.

Weil gives a synopsis of the hemolytic reactions in 82 selected cases in which the diagnosis was fairly certain, being confirmed by the microscopic examination of autopsy or operative material. There were 31 malignant tumors, of which 15 were in an early and 16 in an advanced stage, using the terms early and late in a broad clinical sense. There were three cases of benign newgrowth. There were 42 cases of other diseases. Six of the cases were apparently normal.

It is evident, he says, from his experiments, that the reaction is not pathognomonic of malignant tumors early or late. It occurs in a considerable portion of other diseases, and a large portion of tumors present an altogether different type of reaction. On the other hand, it must be admitted that a much larger percentage of malignant newgrowths present this reaction than is found in other diseases.

Nevertheless, he does not believe the sweeping generalization of Crile will stand the test of further investigation. The method yields results of such a character that great caution and reserve must be exercised in their application to human diagnosis.

Rosenbaum[2] reports the application of Kelling's method of diagnosticating *cancer of the stomach or intestines* by the hemolytic serum reaction.

Seventy patients were examined, of whom 26 were certainly affected with cancer. Of these, 14, or 54 per cent., gave a positive reaction. He believes in further investigations along this line, and considers the test a valuable one.

Kelling,[3] after applying the hemolytic test in 400 cases, believes that it reveals the presence of cancer in the very earliest stages.

Paus[4] examined 90 cases, including 30 healthy persons. A positive reaction was obtained in 65 per cent. of the cases, in which the diagnosis of cancer was confirmed later by operation or by the course of the affection.

Widero,[5] although he does not believe in Kelling's theory that cancer originates from the embryonal cells of other species, says that Kelling's assertions in regard to the hemolytic blood test for the diagnosis of cancer are correct. He makes this statement as the result of testing 50 cases, of whom 25 had cancer and 25 suffered from other affections.

[1] Journal of Medical Research, October, 1908, vol. xix, No. 2, p. 281.

[2] Münch. med. Woch., March 3, 1908, No. 9, S. 443.

[3] Archiv f. klin. Chir., lxxxv, No. 1.

[4] Norsk. Magazin. f. Laegevid., February, vol. lxix, No. 2.

[5] Ibid.; Journal of the American Medical Association, vol. l, No. 11, p. 928.

An editorial,[1] after noting the work of Bard, Weil, Crile, Rosenbaum, Kelling, and Fischel, says that it is evidently too early to ascribe an unqualified diagnostic value to the occurrence of hemolysis in cancer. The work, however, is of value in elucidating the phenomena of anemia and cachexia in cancer, and further investigation, with improvement in method and technique, may some day give us in the hemolytic power of the serum of cancerous patients a diagnostic reaction of great value.

Metastasis. Offergeld[2] has collected 20 cases of *metastasis to the brain from uterine cancer.* In 25 per cent. of such metastases the primary tumor was in the body of the uterus. He found the records also of 5 metastatic cancers of the dura.

Metastasis to the brain may occur relatively early in operable cases of uterine cancer; they are usually combined with other metastases, especially in the lungs and liver. In the brain they are solitary, as a rule, and vary in size from a millet seed to a hen's egg. Five of the metastases he found in the caudex cerebri. Sixteen were in the hemispheres, one was in the rhomboidal fossa, and three were in the small brain.

The metastases were hematogenous. They gave no clinical evidences, and it was especially noted that there were no symptoms of an increase in brain pressure. In three cases there were symptoms of right-sided hemiplegia. In three others there were vague symptoms, possibly indicating organic disease of the brain, but not certainly.

The metastases to the dura were mostly found in connection with inoperable cases. The dura metastases were mostly small and multiple; as a rule, they were lymphatic in origin, but occasionally hematogenous. As a rule, there were no clinical symptoms and no pressure symptoms.

There are no metastases to the spinal cord on record, but most metastatic cancers of the *cauda equina* come as a sequel to cancer of female genitalia. The author believes that the peripheral nerves of the pelvis are more frequently involved in cancer than is generally thought, the involvement arising either through a continuance of growth, or by metastasis through the lymph or blood channels.

Treatment of Cancer. Crile[3] thinks the advancement in the treatment and the prognosis of cancer cases has been marked. Twenty-one years ago Butlin collected statistics of 364 operations for cancer of the larynx, esophagus, kidney, thyroid, and pylorus. Two-thirds of the patients died of the operation, and of the 126 survivors, only one was known to be alive and free of a recurrence after three years.

The elder Gross has been quoted by Halsted as stating that he had never cured a case of cancer of the breast, and yet the latter, after perfecting his technique, reports that 47 per cent. of all cases of breast

[1] Journal of the American Medical Association, vol. li, No. 25, p. 2162.

[2] Zeit. f. Geb., lxiii, No. 1.

[3] Journal of the American Medical Association, June 6, 1908, vol. l, No. 23, p. 1883.

cancer operated on have remained well for three years or more. The operating mortality in representative clinics today is less than 1 per cent.

Martin[1] also sounds a note of encouragement, and calls attention to the increase of operability in cancer cases. In the discussion of this question in the Gynecological Congress at Dresden, it was found that the percentage of operability, which had been 30 per cent. in earlier years, had risen to 80 per cent. and more (Mackenrodt, 92 per cent.), and that the primary mortality had been lowered from 50 to 20, and even lower (Wertheim, 8.7 per cent.). The former 10 per cent. of cures today has risen to 20 per cent.

Winter[2] urges uniformity in reporting the results of the operative treatment of carcinoma. In estimating the result of the primary operation, all postoperative deaths which are attributable to the operation should be included.

The radical operation should consist of the removal of the uterus, its appendages, the upper part of the vagina, both parametria, the hypogastric and the iliac glands. A case designated as operable may prove to be inoperable after the operation has begun. Care should be taken to properly class such cases.

The permanent result should be judged from the freedom of recurrence after five years. In computing the proportion of permanent cures one must take into account the number of patients who died as the result of the operation, the number who have been lost sight of, and the number who have died from some intercurrent disease within five years.

In reckoning the absolute percentage of cure, the number of inoperable cases, the primary mortality, and the recurrences must not be forgotten. All cases which have refused operation, all cases which have been lost track of, and all cases which have died from an intercurrent disease within a period of five years, must be excluded entirely.

For example, up to January, 1908, 200 cases had appeared at Winter's clinic; 5 cases refused operation; 5 were lost sight of subsequently; 5 died of an intercurrent disease within five years of the operation. These 15 cases are excluded from the total number, which is then 185. There were 10 primary deaths from the operation, there were 50 recurrences, and 90 cases were inoperable, leaving 35 out of the entire number of 185 as cured; 35 is 19 per cent. of 185, and, therefore, presents the percentage of absolute cure.

Winter makes an earnest appeal to his fellow gynecologists for an expression of their views, so that a uniform method for reporting carcinoma cases may be decided upon.

Wertheim[3] reports 114 operations for *carcinoma of the cervix*. The operability averaged 42.2 per cent.; 51 have remained free of a recur-

[1] Deut. med. Woch., January 16, vol. xxxiv, No. 3, p. 89.

[2] Zentralbl. f. Gynäk., February 8, 1908, No. 6, p. 169.

[3] Ibid., p. 175.

rence. These figures about agree with those of Winter's, who gives an absolute percentage of cure of 19. If the first 30 cases, in which the mortality was higher than it has been since, are excluded, the absolute percentage of cure is 24 per cent. plus.

The question forces itself upon us, Is five years a sufficient length of time to take as a basis for the estimation of permanent cures? Does not the perfected radical operation simply put off the evil day? In this connection the observation of Lejars[1] is suggestive, and yet it may indicate only the great importance of an early diagnosis and prompt surgical treatment. He says that of 450 operations done by Czerny for *cancer of the stomach*, there are only 3 patients alive who were operated on before 1898; 7 out of 72 are living who were subjected to gastrectomy between 1898 and 1903.

Certain points in technique have been dwelt upon recently. Seeligman,[2] in speaking of *hysterectomy for cancer*, recommends a preparatory treatment by curettage and formalin (5 per cent.) tamponade of the vagina and uterus. When ready to begin the operation the tampon is removed and the vagina and cavity cleaned with sublimate solution. This plan is about the same as that recommended by Mackenrodt. It has my hearty indorsement.

Ryall[3] thinks it is important to draw attention to the implantation of cancer cells which may occur during operation. Recurrences often result from a technique which allows cancer implantation to take place during the operation rather than from a failure to cut wide of the disease.

Weibel[4] gives a detailed account of the *ureteral injuries*, ureteral necroses and fistulas, experienced in 400 cases of the advanced abdominal operation for carcinoma of the uterus.

Ureteral fistula occurred in 24 cases (6 per cent.), and in 3 cases it was bilateral. All of these fistulas resulted from necrosis of the ureter following interference with its blood supply during separation of the ureter from the parametrium or from infiltrating masses of carcinoma. In some cases, evidently when attempting to shell it out, a part of its wall was involved in the cancerous process and was actually lost.

Direct injury of the ureter during operation was relatively infrequent. It occurred in 11 cases, almost always resulting from an insufficient orientation of the ureter. The ureter was completely cut through eight times. It was ligated once, and on two occasions simply incised. In 9 cases the injury was immediately recognized, and the ureter was implanted into the bladder with good result. In the first 200 cases the ureter was wounded eight times, in the last 200 cases only three times.

[1] Semaine médicale, September 30, No. 40.
[2] Zentralbl. f. Gynäk., No. 1, p. 11.
[3] British Medical Journal, October 3, p. 53.
[4] Zeit. f. Geb. u. Gynäk., Band lxii, Heft 2, S. 184.

The cases in which ureteral fistula followed operation were usually bad ones. In but 4 was the parametrium soft and the case favorable; 11 cases were unfavorable, the parametrium being thick and infiltrated, and extensive extirpation of the glands being necessary, although the ureters were not separated to any great extent. In the 9 remaining cases the ureters were isolated for a considerable distance. Only one-third of the necroses could be attributed to isolation of the ureters. In the 11 bad cases the situation of the fistula sometimes corresponded to the site of the most advanced carcinomatous infiltration.

The appearance of the necrosis was tolerably well limited to the time between the seventh and the eighteenth postoperative days. The most critical time was during the second week, when 75 per cent. of all cases occurred. The diagnosis of the fistula was verified by cystoscopic examination and sounding of the ureter.

In regard to the ultimate fate of ureteral fistulas, Wertheim's cases may be considered in relation to two periods of time. Up to the year 1903 there were 8 cases; 6 were cured by nephrectomy, the patients standing the operation well. In most of them pyelonephritis had begun. The earliest nephrectomy was done four weeks, and the latest, twelve weeks after the operation. Two fistulas healed spontaneously.

From April, 1903, only one nephrectomy was done for fistula. The operation was performed three months after hysterectomy, when the indications of a serious pyelitis had appeared. A single case was treated by implantation of the ureters into the bladder by an abdominal operation. The woman died three months later from a recurrence. Another case died from recurrence and pulmonary tuberculosis before the fistula healed. The fourth patient died from serious aortic insufficiency and a pyelonephritis. Except for these cases, the rest of the 11 in a second series healed spontaneously, and none were followed by stricture.

The beginning of spontaneous healing was apparent in one case two weeks after the operation. In three other cases it began within the first month; in 5 cases, within the second; and in 2 cases, within the third and fourth months. Many times an apparent closure was followed by a recurrence of the fistula, urine in small amounts again being passed from the vagina. The chief quantity reached the bladder, and after a few days the fistula would close again.

The conclusions which Weibel draws from a review of his cases are that ureteral fistula following the radical operation for cancer should be treated conservatively as long as possible. They should be systematically touched with a caustic. If there are indications of an ascending infection of the kidney on the affected side, nephrectomy is performed. Implantation is done only when, on account of disease of the opposite kidney, nephrectomy is contra-indicated.

How to protect the ureters during an abdominal operation for cancer is an important question which has been carefully studied by Amann.[1] He says that after an advanced radical operation for carcinoma of the uterus, in which the parametrium as well as the lymph glands, the lymph radicals, and the upper part of the vagina are removed together with the uterus, there will be in the lower part of the pelvis, on each side of the median line, deep pits which serve as a good receptacle for blood clots and predispose to sepsis. The ureters also will be separated for a considerable distance from their underlying tissue.

In the deep pits, hemostasis is almost impossible and a certain amount of gauze drainage is desirable, but care must be taken lest the drainage material causes pressure on the ureters, for this predisposes to necrosis.

The author was in the habit formerly of overcoming the difficulty in these cases by closing the vagina, placing the ureters alongside the rectum, and attaching the bladder to the latter as far as expedient. The large pits at the bottom of the pelvis were then drained through paravaginal incisions.

He has evolved a better technique, which is as follows: With running catgut the vesical peritoneum is sutured to the anterior vaginal wall, so disposing the suture that the lower extremities of the ureters are somewhat elevated and placed in close approximation to the vesical peritoneum.

To protect the parts of the ureter lying exposed at the sides of the pelvis he attaches the lateral border of the peritoneum to the stump of the uterine artery, which is tied close to the pelvic wall, in this way forming a sort of sling which supports without pressing on the ureters and gently holds them in relation with the lateral walls of the pelvis. Very good care is taken in the early steps of the operation not to injure the superior vesical artery.

The posterior wall of the vagina is caught and separated from the rectum to a considerable distance. The posterior vaginal wall is then divided in a longitudinal direction downward until the lateral pits can be well drained by means of gauze strips inserted through the vaginal incision. The peritoneum in contact with the stump of the uterine artery is now sutured to the peritoneal margins on the posterior pelvic wall and the rectum.

The deepest part of the small pelvis is closed off from the general peritoneal cavity by bringing down the sigmoid flexure and sewing it to the vesical peritoneum. If the sigmoid does not reach, the cecum can be used, additional sutures being placed for this purpose.

The method has given very good results.

A champion of the advanced vaginal operation, Staude,[2] gives the results of his experience in the treatment of cervical cancer. He draws

[1] Zeitschrift f. Geb. u. Gynäk., 1907–08, vol. lxi, S. 1.

[2] Zeitschrift f. Gynäk., September 12, xxxii, No. 37, p. 1201; Journal of the American Medical Association, vol. li, No. 16, p. 1383.

attention to the fact that in his *vaginal operation for cancer* he divides the vagina into the parametrium on *both* sides and does not use the simple unilateral incision of Schuchardt.

He operates on 72.3 per cent. of all cases. He is of the opinion that it is useless to extirpate the glands. In fifteen autopsies, the patients dying from cancer, the glands were free in 60 per cent. Schauta found them free in 80 per cent. He calls attention to the fact that Krönig and Döderlein, in their book on *Operative Gynecology*, speak especially of the value of removing a large quantity of parametrial tissue, and recognize some doubt in general as to the improvement in results by removing the glands.

To remove enough parametrium, the author thinks, is the essential point in a cancer operation. He believes that the parametrium can be much better removed from below than from above, but the vaginal operator is unable to remove carcinomatous glands. However, the abdominal operator attempting to remove glands does not invariably accomplish his purpose; he may be successful, or he may fail entirely; it is more or less a matter of chance.

The author has operated on 104 cervical cancers; 21 cases died from the operation, 3 from heart weakness, 1 from embolus, 1 from Basedow's disease, 1 from chronic bronchitis, 1 from necrosis of the ureter, 1 from sepsis, 3 from hemorrhage, and 9 from a pelvic phlegmon which led to peritonitis.

The principal danger is from infection of the cellular tissue, and this is hard to avoid in the worst cases in spite of careful attempts at disinfection. In advanced cases, when the uterus is quite immovable, the paravaginal incisions and freeing of the cervix by blunt dissection may be necessary before the carcinomatous tissue can be properly cauterized and excluded from the operative field. In simpler cases the cautery is used first, and then the two lips of the cervix are clamped together so that the cancerous tissue is fully shut off.

He compares the injury to neighboring organs which Schauta has encountered and which he (Staude) has encountered. *Injury of the bladder:* Schauta, 14.1 per cent.; Staude, 5.8 per cent. *Injury of the ureters:* Schauta, 14.1 per cent.; Staude, 5.8 per cent. *Injury of the rectum:* Schauta, 3.6 per cent.; Staude, 1 per cent.

Up to the present time in the 104 cancer operations there have been 39 recurrences, the majority situated in the scar or in the neighboring stump of the parametrium close to the scar. Recurrence in the glands was seen but seldom—only three times; once in the inguinal glands and twice in the iliac glands. Two recurrences were found in the vaginal incision. The majority of these recurrences appeared in the first year thirty-one times; they appeared in the second year five times, in the third year twice, in the fourth year once.

He says that the value of any method is naturally dependent upon its

permanent result, and this is influenced by the extent to which the operator carries out the procedure. His operative material was taken from 156 cases of cancer of the cervix, of whom 13 refused operation. According to Winter's formula, Staude has an absolute percentage of cure for five years of 23 per cent.

The author gives the technique of his operation in detail.

Jayle[1] reports that he has treated 20 cases of cancer of the uterus. Six cervical cases with no involvement outside the cervix are living and well for from one and one-half to seven and one-half years after hysterectomy. Of 17 advanced cases of cervical cancer, 5 died as the result of the operation, 9 died within a year, 3 have disappeared, and 3 are in good health from five to eight years after operation.

Any positive indication of the extent to which a cancer of the cervix has involved the bladder or ureters would be an important aid in distinguishing inoperable from operable cases and in prognosis. Fromme has attempted to do this by cystoscopic examination of the bladder. He[2] used *cystoscopy* in 110 cases of cancer of the cervix, in 65 of which he was unable to detect any essential modification of the vesical cavity. In all of these cases the detachment of the bladder was easily affected and the ureters were undilated.

In estimating the *extension of the carcinoma to the bladder*, the projection or distortion of the trigone, by itself, is not important. In 15 cases there was vesical edema, bullous in 4, and in all these the detachment of the bladder was difficult.

An unfavorable prognosis may be attached to edema of the ureteral orifice, as was proved in 11 instances. In such cases it is to be expected that the separation of the ureter will be difficult or impossible.

Lightning Treatment or Fulguration. The newest form of treatment is what is known as the lightning treatment or fulguration, a method devised and exploited by Keating-Hart. This is believed by Czerny[3] to offer another means of combating cancer as well as lupus, tuberculous ulcers, etc.

He[4] has used fulguration in the treatment of carcinoma in 35 cases. The method consists in the application of as powerful an electric spark as possible from a metal electrode, at a distance of from 2 to 4 cm., with a frequent change of position, and for a period of five, ten, to forty minutes, the patient being fully anesthetized. The carcinomatous tissue is then extirpated with a knife or a sharp curette, and the wound exposed to the spark for ten to fifteen minutes and longer.

[1] Revue de Gynécologie, No. 5, xii; Journal of the American Medical Association, vol. li, No. 23, p. 2007.

[2] Monats. f. Geb. u. Gynäk., Band xxvii, H. 2; Abstract Journal of Obstetrics and Gynecology of British Empire, May, vol. xiii, No. 5, p. 366.

[3] Archiv f. klin. Chir., lxxxvi, No. 3.

[4] Münch. med. Wochenschrift, 1908, vol. lv, No. 6, p. 265.

The apparatus required can be attached to the ordinary Röntgen outfit. The reader is referred to Czerny's article for descriptions and illustrations.

As the result of his observations, the author believes that fulguration is suitable for the treatment of superficial, especially ulcerating, skin and mucous membrane cancers, and because of its selective action on the diseased tissue that it is more efficacious than the ordinary operation.

It is easier to persuade the patient to have this sort of treatment than a cutting operation, and for that reason carcinoma can be treated earlier and more radically.

Whether cures from fulguration are permanent, and whether recurrences appear more infrequently than after cutting operations, one will only be able to say after five years. It will be easier also to persuade patients to have recurrences to be treated in this way.

Fulguration does not destroy the cancer cells completely, for mouse cancers apparently killed by the treatment were successfully transplanted. Complete destruction is only attained when the treatment was given to such an extent that the cancer cells were entirely dried up.

Does this form of treatment inflict any injury upon neighboring tissues and organs? Arndt and Laqueur,[1] after declaring that deep narcosis is not necessary for the fulguration treatment if the skin is protected from the sparks, say that the method is slightly irritating to the skin, as well as to the muscles and joints. It has no noteworthy action upon the heart or the respiration, although the heart exhibits some arhythmia and blood pressure is lowered, so that fulguration of the chest must be undertaken with care.

Upon the brain and the dura mater the method may be used for some time without causing directly any bad results. Slight irritation may be avoided by the employment of shorter sparks.

Fulguration of the digestive tract and the urinary bladder produces strong peristaltic contractions, but only when the sparks are directly applied. Dry compresses prevent this action.

Directly after fulguration, removed particles of tissue and of tumors show no change, with the exception of a slight superficial necrosis. The physiological action of the direct monopolar application of the high frequency current is similar to fulguration in many ways, and even goes beyond it.

Schmidt[2] reports that Keating-Hart, by the lightning treatment of different forms of carcinoma, has obtained the following results: In carcinoma of the skin, chiefly of the face, the cures were 95 per cent.; in mammary cancer, 40 to 50 per cent.; in cancer of the mucous mem-

[1] Berliner klin. Wochenschrift, August 3, 1908, No. 31, p. 1440.

[2] Münch. med. Woch., 1908, No. 30, S. 1610; Abstract Journal of Obstetrics and Gynecology of British Empire, September, vol. xiv, No. 3, p. 216.

branes, 20 to 25 per cent. Lingual and laryngeal cancers have always given the worst results.

The cases most amenable to treatment are those in which it is possible for the fulguration to reach all parts of the cancerous tissue.

It was pointed out in the discussion of this paper that Strebel, who was an advocate of fulguration and published favorable results in 1904, had recently very considerably limited his recommendation. On the ground of some years' experience, he declared that radiation with the electric sparks, at any distance long or short, and with or without refrigeration, has a purely local effect and does not cure, and consequently does not inaugurate a new epoch in the treatment of cancer.

Trypsin. Although the treatment of cancer by means of trypsin and other pancreatic ferments is more or less discredited, I have considered an article by Graves of sufficient interest to include in this review.

He[1] gives a very clear outline of Beard's theory, upon which depends the *rationale* of the trypsin treatment of cancer.

The germ-cell theory of cancer is founded, of course, on the familiar germ-cell theory of heredity, which postulates a twofold generation of cells in the body; one, the germ cells, represented normally by the spermatozoa or ova, and the other the body cells or somatic cells which make up the rest of the tissues of the individual. The germ cells, if impregnated, are continuous, never lose their vitality, and have the potentiality of immortality, while the somatic cells, namely, the mortal body, constitute merely a lateral or terminal offshoot of the germ cells. They decay and are cast off like the leaves of a deciduous plant.

Starting then with the normal female germ cell or egg, this cell, after union with the male germ cell or spermatozoön, begins to develop by mitotic division into a newformed body. The first stage of this development in mammals is the chorion, which corresponds to the larva in lower orders, and is in general termed by Beard the trophoblastic or preembryonic stage. In this stage the embryo has not yet been born.

The cell division then continues, and a number of spores are born from the chorion, destined to become true embryos. In long past ages, many or all of these might have developed into embryos and become complete individuals. In the higher mammals, man, for example, usually only one becomes an embryo. The other spores, originally destined to become embryos, are, as it were, aborted and remain as retrogressive cells included in the complete embryo. One or more of them may, however, develop normally, and there results then the phenomenon of identical twins or triplets. Or one of them may make an *incomplete* attempt to repeat the life cycle, and there results a double monster; or if the attempt is still less successful, a teratoma, and so on, down through mixed tumors, etc., to pure carcinoma or sarcoma.

[1] Boston Medical Journal, January to June, 1908, vol. clviii, No. 1, p. 121.

It will thus be seen that, according to Beard, a carcinoma or sarcoma represents the abortive attempt to repeat the life cycle of one of these germ-cell spores, originally destined to become a fetus. It will be seen, too, that the carcinoma and sarcoma represent only the lowest stage in development of a germ cell, the more successful ones, if growing, attaining the distinction of producing a higher tumor, *i. e.*, one more nearly approximating the complete individual, teratoma, double monster, or identical twin. Recalling now that the earliest stage of development in the normal germ cell or fertilized egg is the chorionic stage (or, as it was termed, the preëmbryonic or trophoblastic stage), it follows that a cancer cell, being an abnormal germ cell in its lowest stage of development, corresponds to a chorionic or trophoblastic cell. Hence, Beard's first and often repeated postulate that the cancer cell is an "irresponsible trophoblast."

According to Beard's reasoning, a chorio-epithelioma is the prototype of all malignant tumors. There is no essential difference between malignant growths, and there is no such thing as primary cancer of any particular organ in the sense that the growth is made up of the original cells of that organ. The abnormal germ cell happens to make its attempt at repeating the life cycle in the certain organ or tissue and by unconscious imitation reproduces the form of tissue to which it happens to lie.

In regard to the use of trypsin, it is a fact that the chorion begins to degenerate at the time that the pancreas of the embryo begins to functionate, in the seventh week. Beard reasoned that the pancreatic ferment, having no digestive duties to perform in the intestine, was probably employed to destroy further activity of the chorion, and that when the embryo was absent or incomplete, the chorion, having no ferment to check it, was apt to develop into a malignant tumor or chorio-epithelioma. He found by experiment that the trypsin of the pancreatic secretion actually has a specific destructive effect on chorionic cells, and that it also neutralizes an acid intracellular ferment secreted by the chorion.

The investigations of Blumenthal, Newberg, and others on the chemical properties of cancer cells show that trypsin quickly dissolves the cells, while pepsin attacks them with difficulty.

Cancer cells produce an intracellular acid ferment which is capable of dissolving all the tissues of the body and is termed malignic acid. This ferment is neutralized by trypsin. (Beebe has recently thrown some doubt on the value of these conclusions.)

It is a well-known fact that trypsin is found in nearly every tissue of the body, but is absent in cancer tissue; that hydrochloric acid and consequently pancreatic secretion is diminished in subjects suffering from cancer; that primary cancer of the pancreas is extremely rare; that cancer of the small intestine is very uncommon, and increases in rarity toward the duodenum.

Graves' own investigations in the treatment of cancer by trypsin were

started in September, 1906. His observations and conclusions for the most part are based on the treatment of 6 cases of recurrent cancer, where whatever evidence he could get was as authentic as possible. These cases represented 5 of recurrent breast carcinoma and 1 of recurrent, squamous-cell carcinoma of the cervix uteri. In all of the cases he had personally done all that was possible in the way of surgical operation, and had also made careful microscopic examinations of tissues removed at operation. All of the cases were observed for at least six months, and most of them longer, up to fourteen months. The treatments were given in the usual way, beginning with from 3 to 5 minims of trypsin, and increasing the dosage to from 40 to 60 or even 80 minims each time.

In regard to the curative property of trypsin, he is obliged to say that in every one of the 6 cases there was a gradual inevitable progress of the disease; 4 have died, and 2 still living undoubtedly will die within a few months.

Notwithstanding the apparently complete failure which ultimately followed all his efforts, there are certain encouraging features which have induced him to proceed in its use. In cases of recurrent breast carcinoma it has been possible to keep well under control the nodules which make their appearance. A few injections of trypsin into one of these circumscribed nodules will cause it either to disappear or to shrink greatly, *and that particular nodule will not grow again.* This has been the most striking result of the treatment. In the two cases now living supraclavicular masses in both and an axillary mass in one, interfering with the motions of the arm, were greatly reduced in size, and after seven or eight months show no signs of growth. A section of such a shrunken nodule after several treatments will show under the microscope the remains of destroyed cancer cells, while the somatic cells of the connective tissue remain intact and healthy.

These observations which were made by Graves correspond, he says, in every particular to those made by Beard in his experiments in the treatment of Jensen's mouse tumor. In two of his cases, for a period of a few weeks, there was no external manifestation of cancer whatever, and an enthusiast might have considered them cured. Whenever in a case treatment was stopped, the progress of the disease increased with great rapidity, the change for the worse being so marked as to convince him that the treatment had been efficacious in delaying the final outcome.

Graves' experience with trypsin, he says, apparently corresponds closely with that of others. Thus, von Leyden, after numerous experiments, concluded that although trypsin had a curative influence on cancer the method of applying it successfully had not yet been discovered.

Pinkuss[1] has employed the pancreatic ferments in the treatment of 4 cases of inoperable cancer.

[1] Zeitschrift f. Geb. u. Gynäk., 1907-08, Band lxi, S. 400.

He says that the possibility of a specific action of trypsin in subcutaneous injection upon a localized cancerous collection is not to be denied. Whether actual cures result will only be known after the employment of this measure for a number of years and in a large number of cases.

Weinstein,[1] in order to test the efficacy of the trypsin treatment, tried it in 10 cases of *cancer of the digestive organs*. They were treated by subcutaneous injections of trypsin and amylopsin according to the rules laid down by Beard and Saleeby. The results were entirely negative. No permanent improvement was noticed in any. There were some periods of improvement and at times a temporary lull in the symptoms. The immediate cessation of the severe pain which Saleeby so authoritatively speaks of was not seen in a single instance. In the author's opinion, the method is a total failure.

An editorial[2] points out that the claims of Saleeby in regard to the efficiency of Beard's treatment have not been substantiated. This journal has criticised Saleeby's statement and expresses skepticism concerning the cases which the author claims to have been cured or benefited.

Treatment of Inoperable Cancer. Schöne[3] thinks that even apparently hopeless cases of cancer should be given the benefit of some plan of treatment, and believes that there is always some chance of a spontaneous retrogression.

Fleischmann[4] reports 3 cases in which a recurrence of cancer did not take place after an incomplete operation.

1. A case in which an extension of cancer from the fundus of the uterus to the surface of the sigmoid was not removed; the patient lives without sign of trouble after three years.

2. A case of incomplete vaginal extirpation in which some cancerous tissue was left in the right parametrium; the patient remains well eleven years after vaginal hysterectomy.

3. A vaginal hysterectomy in which the cancer had penetrated the anterior wall of the cervix and invaded the right parametrium. The patient remains well after eight years.

All of the cases were verified histologically.

Maier[5] reports the use of *acetone* in 4 cases of inoperable cancer. His results are very much like those of Gellhorn, whose paper referred to last year and who originated the treatment. The benefit of the method is apparent almost from the beginning. There is no return of the hemorrhage, the discharge ceases, the patient no longer lives in a foul atmosphere, and the system is not subject to the drain imposed upon it

[1] New York Medical Journal, August 29, 1908, vol. lxxxviii, No. 9, p. 400.
[2] British Medical Journal, January 11, 1908, vol. I, p. 97.
[3] Med. klin., March 12, iv, No. 15.
[4] Wiener klin. Wochenschrift, October 22, No. 43, p. 1492.
[5] Therapeutic Gazette, July, 1908, p. 460.

by the loss of blood and discharge. The appetite returns and general health improves. Pain is not diminished and not increased, and was always controllable with aspirin. The diseased area becomes visibly diminished, the cavity is reduced in size, and its walls are smooth and firm.

Gwyer[1] reports the further results of using *thymus gland extract* in the treatment of inoperable cancer. There were 16 cases. Death occurred in 6, within a period of eleven days to three and one-half months. In general there was less pain, the growth was reduced in size and the general condition improved, the deaths in some instances may have been due to a liberation of some toxic material by the thymus extract, which was not eliminated.

He administers the dried gland in a powdered form, 1 to 2 drams three times a day, or a watery extract hypodermically. In conjunction with the thymus gland, he has used potassium iodide, bicarbonate of soda, and acetate of soda to assist in elimination from the skin, kidney, and bowels.

Other Plans of Treatment.. Strauss,[2] believing that cancer might be cured by inoculating subjects of this disease with *serum* taken from one of the lower animals suffering from this condition, reports his results in 6 cases. He concludes that it should be used after every operative case to immunize the system and to prevent recurrence, and that if the growth be inoperable, the injection of serum relieves the pain and ameliorates the symptoms without interfering with the natural functions of the body.

Hofbauer,[3] noting the existence of *lecithin* in malignant growths and wishing to minimize its stimulating properties on intracellular ferments, has been experimenting with the injection of antifermentative sera into the periphery of the tumor or into the growth itself. He used atoxyl, quinine, beef serum, and cholesterin. In 20 cases of inoperable cancer there was improvement in every case, so that there is no doubt of the influence of the treatment.

Sticker,[4] working along the same lines as Hofbauer, used a combination of the blood of sheep followed the next day by *atoxyl*. The cases in which this treatment was used were tumors of the surface which could be easily observed. The effect on the cancer was remarkably quick and beneficial, although no permanent result was seen in any case.

Falk[5] reports 10 cases which he has treated with the injection of *defibrinated placental blood*. The result was only temporary, and placental serum cannot be considered a means of destroying carcinoma.

[1] Annals of Surgery, April, p. 506.

[2] Journal of the American Medical Association, October 31, 1908, vol. li, No. 18, p. 1488.

[3] Berliner klin. Wochensch., July 27, 1908, No. 30, S. 1389.

[4] Ibid., S. 1391.

[5] Ibid., S. 1394.

Odier[1] reports further success with *glycolytic ferments* in the treatment of cancer. He gives directions as to the preparation and the exhibition of the ferment.

An editorial[2] calls attention to the report of Myler, published in 1904 in the *Archives of the Middlesex Hospital*, concerning the results which were obtained in the cancer series of the hospital with Otto Schmidt's "*cancroidin.*"

Although Schmidt expressed himself as satisfied with the cases selected for treatment, the results obtained were absolutely negative. Neither a diagnostic reaction nor the slightest influence on the condition was observed. He says the report of Baisch[3] is therefore surprising, and in some respects stands in contrast with that of Myler. It must, however, be observed that the therapeutic result in 7 cases was negative.

The editor further remarks that there is no reason to doubt that a parasite-like structure has been observed in malignant tumors which corresponds to what Schmidt has described. This parasite, however, when killed and injected in suitable quantities into the subcutaneous tissue of persons suffering from malignant disease, has no apparent therapeutic effect, and its diagnostic importance, at least, seems to be doubtful.

Skyoff[4] has employed a method of suction in the treatment of cancers which has been successful mostly in inoperable epithelioma of the face.

Naegeli-Akerblom and Vernier[5] recommend the application of an aqueous alcohol solution of *arsenous acid* for epithelioma. This is the method of Czerny and Trunecek.

Adenomyoma of the Uterus. Cullen in his book on *Adenomyoma*, which recently appeared, makes an effort to establish a set of symptoms which would lead more frequently to a pre-operative diagnosis of adenomyoma. His youngest patient was nineteen and the oldest sixty years, the disease being most prevalent between the thirtieth and the sixtieth years. Sterility was not frequent.

Lengthened menstrual periods are the first symptom. The flow gradually assumes the proportions of a hemorrhage, and eventually becomes continuous.

At the menses there is often discomfort, and occasionally a grinding pain in the uterus, evidently due to the increased tension, since all the islands of mucosa scattered throughout the diffuse myoma naturally swell up, and thus increase the size of the organ.

[1] Presse Méd., February 19, xvi, No. 15; Journal of the American Medical Association, vol. l, No. 13, p. 1084.

[2] British Medical Journal, April 25, 1908, vol. l, p. 1009.

[3] Deutsche. med. Wochensch., February 13, 1908.

[4] Zentralblatt f. Chirur., January 25, xxxv, No. 4.

[5] Therapeut. Monats., October, xxii, No. 10; Journal of the American Medical Association, vol. li, No. 20, p. 1740.

In over two-thirds of his cases there was no intermenstrual discharge. This he regarded as perfectly natural, for in these cases the uterine mucosa is normal and no disintegration of tissue is going on.

He considers the clinical diagnosis of diffuse adenomyoma relatively easy for the following reasons:

1. The bleeding is usually confined to the period.
2. There is usually much pain, referred to the uterus, at the period.
3. There is as a rule no intermenstrual discharge of any kind.
4. The uterine mucosa is perfectly normal or somewhat hypertrophied.

He says that no other pathological condition of the uterus commonly gives this characteristic picture.

In this he differs from Grünbaum,[1] who has analyzed 20 cases of adenomyoma of the uterus occurring in Landau's clinic, Berlin, in order to see whether there were any distinctive clinical signs by which adenomyoma might be distinguished from *fibromyoma.* Freund, after a similar investigation, reported that adenomyoma patients usually had a sickly childhood and that menstruation began later than usual. Very frequently the menstrual flow was profuse and very painful. The general well-being was considerably disturbed and the long duration of the tumor led to almost complete incapacity for work. Objectively, there were evidences of general hypoplasia and infantilism, tumor-like projections on the posterior surface of the uterus, fixation of the pelvic organs by adhesions, and the direction of growth of the adenomyoma extended characteristically from the tubal angle downward to the cervix.

Pick very quickly expressed doubt as to the correctness of Freund's conclusions, in which he was joined by Landau, who gave the following conclusions as the result of his experience: Adenomyoma cannot be distinguished clinically from fibromyoma, and the only necessity for a distinction between the two varieties of growth lies in the selection of the type of operation for the individual case. Adenomyoma is not amenable to enucleation, and if large, nothing but a total extirpation of the uterus will suffice. In the case of adenomyoma of the paroöphoron, conservation of the uterus itself is possible. The prognosis is quite good. Degeneration, necrosis, suppuration, and gangrene are not observed in adenomyoma. There is no tendency to spontaneous expulsion.

After examining 100 cases, Kudoh and Polano fully confirmed Landau's views. A sharp clinical differentiation in the sense of Freund was not possible in the overwhelming majority of cases. All the so-called characteristic symptoms failed to be present sometimes in typical adenomyoma and yet appeared in fibromyoma. The most striking features were the frequent occurrence of adhesions and adnexal inflammations in adenomyoma and the failure of degenerative processes of the tumor itself.

[1] Archiv f. Gynäk., Berlin, 1908, Band lxxxvi, No. 2, S. 387.

An examination of 20 cases by Grünbaum, in which there were good clinical and pathological records, elicited the following facts:

The age varied between thirty-two and fifty-one years; the average was forty-one years. Two were single, seventeen were married. Six had borne children—four, one child; two, three children—and ten were sterile. Sterility is somewhat more frequent in adenomyoma than in ordinary fibromyoma. Kudoh gave 47 per cent. of sterile marriages in adenomyoma in comparison to 20 per cent. in ordinary fibromyoma.

The symptoms of which the patient complained were mostly (11 out of 20) menorrhagia or irregular bleeding, which was unaffected by curettage and cauterization. Nine patients complained of severe pain in the hypogastrium and the loin, especially bad during menstruation.

In three women the pain was particularly confined to the bladder and associated with dysuria, complicated in two cases with complete retention, so that frequent catheterization of the patient was required.

The assertion of Freund that signs of infantilism are frequent in the subjects of adenomyoma was not borne out. Ten of the patients were strongly built, and the first period occurred not later than the thirteenth or sixteenth year.

In a few of the cases there were inflammatory alterations, but even in some large intraligamentous adenomyomas there was no pelvic peritonitis. From the standpoint of diagnosis, the frequent association of adenomyoma with adnexal tumors is not of great significance; the same thing occurs in the case of the ordinary myomas.

The diagnosis in none of the 20 cases was made before operation. In the majority of instances the diagnosis of adenomyoma was first made in the laboratory, although in some it was apparent at the time of operation.

The author cites 4 cases of adenomyoma in detail, of which there was prolonged clinical observation before operation, and shows that in none of them was it possible to distinguish between fibromyoma and adenomyoma.

The infrequency of degeneration in adenomyoma is explained by the close connection between the tumor and the uterus and the consequent good nourishment. The combination of *adenomyoma* and *carcinoma* is not very frequent. It may occur in one of three groups: (1) Malignant degeneration of the adenomyoma itself (primary cancerous degeneration of the glands); (2) carcinoma of the uterus, with coincident cancerous degeneration of an adenomyoma; (3) cancer of the uterus and, independent thereof, adenomyoma.

Dillmann has described two cases belonging to the first group. Kaufmann, Rolly, Babesen, and Schwab have reported others. Von Recklinghausen, Cullen, Meyer, and Babes have reported cases belonging to the second group. Cases belonging to the third have been reported by von Recklinghausen and Cullen, and to this Grünbaum adds a case.

Sarcomatous degeneration of an adenomyoma has been reported in only a few cases (Kaufmann, Iwanoff, and Bauereisen). *Tuberculosis of an adenomyoma* had been observed five times (von Recklinghausen, Lichtenstein, Hösli, Archambauld and Pearce, and Grünbaum). Ernst[1] also says that adenomyoma cannot be diagnosticated with certainty before operation.

Fibroid Tumors in Young Persons. Landau[2] reports that he has had 42 cases of myoma in patients between the ages of twenty and thirty. He was led to look up his own experience in this matter by a case of myoma in a twenty-two-year-old virgin.

Records of the following cases are upon his cards:

Cases.	Years.
2	20
1	21
2	22
2	23
6	24
2	25
4	26
2	27
8	28
7	29
7	30

Bland-Sutton[3] reports 101 hysterectomies for fibroid tumors of the uterus without a death.

Endometritis from the Standpoint of Treatment. Anspach[4] has investigated the clinical importance of endometritis as it has occurred in my service at the University Hospital, pointing out that at present it is a matter of some importance to know just how frequently the endometrium is the seat of inflammatory or other changes which require treatment. Such knowledge is especially valuable in reference to cases in which the sole pelvic lesion is supposed to be located in the mucosa of the uterus.

The idea which is more or less prevalent concerning the part played by the endometrium in pelvic diseases is a matter of surprise. For the truth is that the endometrium of itself is rather infrequently the seat of any pathological alteration which would justify treatment directed to it alone. Notwithstanding this fact, the pathology and the treatment of endometritis are widely discussed.

Tucker first drew attention to the unwarranted consideration the subject is given in text-books. Thus, in six books taken at random, twenty-

[1] Archiv f. Gynäk., Band lxxxv, Heft 3, S. 712.

[2] Berliner klin. Wochensch., April 20, 1908, No. 16, p. 780.

[3] Journal of Obstetrics and Gynecology of British Empire, May, vol. xiii, No. 5, p. 328.

[4] Journal of the American Medical Association, March 14, 1908, vol. l, p. 842.

seven different varieties of endometritis were described and not a single one of them was mentioned in every book.[1]

This practice exaggerates the importance of the endometrium in the eyes of the general practitioner. In a large number of instances a chronic discharge is regarded as *prima facie* evidence of endometritis. Hunner calls attention to the query so often heard, "What do you do for endometritis?"

As a matter of fact, inflammation of the endometrium occurs in all cases of *gonorrhea* which advance beyond the cervix, but the clinical distinction between an acute or a subacute endometritis and a beginning salpingitis is difficult, and the therapy of acute cases is always rest and the application of heat or cold; never an operation or local treatment. When gonorrhea of the endometrium becomes chronic it is usually complicated by inflammatory lesions of the tubes and ovaries. A chronic uterine discharge in gonococcus cases, where the adnexa are not involved, almost invariably comes from the cervix. In neither instance is treatment directed solely toward the endometrium of any service.

Acute infection of the decidua or of the endometrium may be incident to labor and abortion. Under such circumstances it is advisable to make sure that there is no remnant of the placenta or the membranes in the uterine cavity, and then to treat the case palliatively, unless a pelvic lesion outside the uterus or in the uterine wall is demonstrable.

The class of cases in which the diagnosis and treatment of endometritis is most abused is that in which *leucorrhea* is the chief symptom, and no reason can be found for it by pelvic examination. It is in cases of this sort that a most careful study of the patient is required in order to find the real cause of the trouble.

[1] The description of so many varieties of endometritis leads to an overestimate of the importance of this disease. A multiplication of terms exists because the affection is classified from so many different standpoints. For example, "glandular," "hemorrhagic," and "gonorrheal" endometritis may be applied to the same individual case, as one indicates the form of the disease from the histology, symptoms, or cause. The anatomical classification, or one based on the histology of the endometrium, is to be preferred, because it is the simplest and because it limits the number of descriptive terms. By this means endometritis may be reduced to acute and chronic forms. The chronic are divided into glandular and interstitial. There are a few further subdivisions of glandular endometritis, but they are of interest chiefly to the pathologist, and have no special clinical importance. It is, of course, commonly recognized that acute endometritis is usually the result of gonorrhea or of septic infection of the endometrium. Aside from these two terms, "acute gonorrheal" and "acute septic," it is difficult to indicate the histology of an endometritis by names which are descriptive of its source. There is no definite relation between the form of chronic endometritis and the cause, and this is a sufficient reason for not using the etiological classification. It is unnecessary to point out the numerous varieties that a classification based on symptoms would entail. The terms "suppurating," "exfoliative," "putrid," which have been used to designate certain cases of endometritis, are sufficient indications of the extent to which such a classification may be carried; the words "virginal" and "senile" as applied to this disease mean very little, and should not be used.

What other lesions in addition to those primarily affecting the uterine mucosa may cause a persistent uterine discharge? General ill health associated with constipation and a sluggish pelvic circulation undoubtedly may induce a hypersecretion of the endometrial glands. In such a case the cause is general, and unless the underlying condition has persisted long enough to produce anatomical alterations in the mucosa no treatment directed especially against the endometrium will do any good.

In order to determine the clinical significance of endometritis, Anspach critically analyzed the cases in which a histological examination of the endometrium had been made in the gynecological department of the University Hospital up to October 1, 1907. There were 483 specimens. They included scrapings from the uterus in 174 cases in which dilatation and curettement alone was performed; 81 cases in which curettement was done previous to amputation of the cervix or trachelorrhaphy; and 53 cases of retroposition of the uterus in which curettement preceded the operative measure to correct the malposition. Sections were also taken from the endometrium in 78 hysteromyomectomies for fibroid tumor of the uterus, and in 60 hysterectomies for pelvic inflammatory disease. In estimating the lesions under endometritis there were included all those alterations which Hurdon has described as glandular hypertrophy, edema of the endometrium, etc. The endometrium was classed as normal only when there was no anatomical alteration recognizable grossly or by the microscope.

The result was as follows: Out of 174 cases of dilatation and curettement the endometrium appeared normal in 80, or a little less than half; among 81 cases of repair or amputation of a lacerated cervix the endometrium was normal in 15; in 78 hysteromyomectomies the endometrium was normal in 11; out of 60 cases of pelvic inflammatory disease the endometrium was normal in 12, and in 53 cases of retroposition of the uterus the endometrium was normal in 24. As curettement was not performed and the endometrium was not examined in any cases which did not present the possibility of endometrial disease or malignant growth, the number of times alterations were found represented the frequency of endometritis in the service at the University Hospital from October, 1899, to October, 1907. There were 2286 gynecological patients during this period. Among them were the 337 instances of diseased mucosa, but only 94 occurred as clinical entities, and 243 were associated with more serious lesions requiring operation.

The endometrium was diseased in no more than half of the cases in which curettement was done for a suspected endometritis. The endometrium was usually affected in connection with some other lesion which required treatment, as is evidenced by the comparative frequency with which it was found associated with a diseased cervix or fibroid tumors or pelvic inflammatory disease. Even in those cases of retroposition in which the patients had complained of a discharge the endometrium was normal in a large proportion.

The practical conclusion to be drawn is that one must be very guarded in promising a patient that a given uterine discharge will be cured by curettement. Furthermore, the non-operative treatment of leucorrhea by the direct application of antiseptic or caustic solutions to the uterine cavity almost never is justified. Such a plan would, as already indicated, be useless in half of the cases, even though none of the dangers incident to a proceeding of this sort made themselves manifest. The treatment of endometritis by intra-uterine applications of formalin, so fully described by Menge several years ago, should never find a place in the therapy of a general practitioner, and never in the hands of a gynecologist, unless the patient is under ether and the cervix has been dilated.

A chronic discharge from the uterus which is dependent on pelvic disease usually requires more than a curettement or intra-uterine applications. In the case of a uterine discharge for which no pelvic origin is apparent, general tonic and hygienic treatment should be given a fair trial before resorting to curettement or to any intra-uterine manipulations.

Theilhaber and Meier[1] note that it has been observed already that the *histology of the normal endometrium* varies in different individuals with the period of life, and has a modified structure immediately before and immediately after the menstrual periods. They detail a number of cases, and conclude that an increased secretion from the body of the uterus may be caused by hypersecretion of the uterine mucosa in consequence of venous engorgement, disturbance of circulation, psychical or erotic irritation, masturbation, chlorosis, etc., when the discharge is usually clear and mucous.

An actual endometritis in a majority of cases is of gonococcus origin, and the discharge is purulent. They do not attach much importance to hemorrhage or to pain as a symptom of endometritis.

An increased discharge, due to hypersecretion, should be treated by general measures, including hydrotherapeutic, hygienic, and psychic treatment. In some cases they use zinc chloride or formalin. Expectant treatment is advisable during the acute stage of a gonococcus endometritis, but in the chronic stage energetic treatment is necessary.

They advise free drainage in chronic cases, so as to guard against the retention of secretion, and do this by dilating the cervix every few days and rinsing out the uterus with a weak solution of some silver preparation or of ichthyol.

Kolischer[2] describes the treatment he uses for *chronic gonorrheal endometritis*. The uterus is tested in order to determine its reaction to the introduction of a foreign body. If this precaution is omitted the operator will occasionally encounter a uterus which reacts to any intra-uterine interference with such violent contractions that the resulting

[1] Archiv f. Gynäk., Band lxxxvi, Heft 3, p. 628.

[2] Surgery, Gynecology, and Obstetrics, May, 1908, vol. vi, No. 5, p. 527.

uterine colic may last several hours, even causing the patient to faint from pain.

When the uterus does not contract painfully, or after its sensitiveness has been obtunded by repeated soundings, the cervix is exposed and the portio and adjacent parts of the vagina are thoroughly cleansed. The uterine cavity and the cervical canal are freed from adherent pus and mucus by introducing a swab saturated with a concentrated solution of bicarbonate of soda. The swab is left for a minute or so in the uterus and then withdrawn, the liquefied mucus and pus being expelled as a big plug. The anterior lip of the portio may be seized with a tenaculum, but the uterus should never be drawn down, simply steadied.

A swab soaked in a 3 per cent. albargin solution is now introduced into the uterine cavity, and is allowed to remain there for five minutes; after it is withdrawn a tampon, carrying an ichthyol-glycerin solution of equal parts, is inserted into the vagina and pushed up against the portio. The next morning the patient removes the tampon and cleanses the parts with a hot douche of salt water. As a rule, a slightly bloody discharge appears after a few treatments. This does not interfere with its continuance, and is a favorable symptom.

This plan is continued daily until the discharge disappears and until repeated examinations of the mucus from the uterus and from the cervix fail to show either pus cells or gonococci. The specimens should be taken during and after menstruation and when provocatory influences have been brought into play, *e. g.*, twenty-four hours after the patient has taken some charged alcoholic beverage, or twenty-four hours after the mucosa has been touched up with a 1 to 1000 bichloride solution.

When the case is torpid and the albargin solution does not cause sufficient reaction, a 40 per cent. formalin solution should be used on the swab. This should be immediately followed by the insertion of a large ichthyol tampon in order to keep the formalin from flowing down on to the vagina and vulva.

The author employed this treatment in 43 cases. Of these, 4 stopped coming; 7 could not be located; 3 became re-infected. The balance appear to have been cured.

If the endometrium is very rough, the treatment is preceded by curettement. This is done not to influence the infection, but in order to make the tissue more amenable to application. Success by this plan can be expected only when one is able to prevent a re-infection.

Menge[1] continues to use the treatment for chronic endometritis which he advocated a number of years ago and which we reviewed at length in Progressive Medicine. The technique is about the same as that previously described. In but twelve out of hundreds of cases was

[1] Therapie der Gegenwart, April, xlix, No. 4; Journal of the American Medical Association, vol. l, No. 20, p. 1659.

the procedure possibly responsible for the extension of a gonorrheal endometritis to the tubes.

Rector[1] believes that the first principles of modern therapeusis as applied to diseased mucous membranes is frequent cleansing of the surface with a non-astringent, non-irritating solution, for the purpose of removing the adhering secretion, opening the glands, releasing any retained secretion, and preventing germ propagation. In addition, glandular activity should be stimulated directly or indirectly through the secretory nerves, and the normal equipoise between the vascular supply and the innervation should be restored. He thinks he has accomplished this purpose by means of *galvanism*, using the negative pole within the cavity of the uterus, and simultaneous irrigation of the endometrium with a non-astringent, non-irritating solution. He has invented a combined intra-uterine electrode and irrigator.

Goelet[2] employs a more or less similar method, failing also to record the number of cases so treated.

Myopathic Metrorrhagia and Menorrhagia. Chronic Metritis. Arteriosclerosis of the Uterus. In the past few years I have devoted considerable space to myopathic uterine hemorrhage. It concerns those cases of persistent and often life-endangering hemorrhage from the uterus which are attributed to some lesion in the wall of the uterus. To the studies of Theilhaber and Meier, Shaw, MacDonald, Gardner and Goodall, Anspach, and others, which have already been presented, may be added a few of more recent publication.

Kubo[3] examined all the scrapings curetted from patients suffering from menorrhagia or metrorrhagia, in whom the cause of the bleeding was not found clinically. Among 99 cases there were 9 in which he was able to study also the muscle of the uterus with regard especially to changes in its bloodvessels and structure.

He found an abnormal condition of the cervical mucosa in 6 cases, acute endometritis in 1, subacute endometritis in 4, chronic endometritis in 10, hypertrophy of the glands in 12, a polypoid endometrium in 8, and a normal endometrium in 56. After studying the specimens of myometrium, he found no definite alteration common to all to which the uterine hemorrhage could be attributed.

Ahreiner[4] reviewed the literature of the so-called chronic metritis, and reported 5 cases in detail. He came to the conclusion that at the present time there is no pathological alteration which can be considered characteristic and as occurring only in that disease. The entire parenchyma is increased, the connective tissue as well as the muscle, the connective tissue perhaps a little in excess.

[1] Journal of the American Medical Association, March 28, 1908, vol. lxxiii, No. 1, p. 520.

[2] Medical Record, April 25, 1908, vol. lxxiii, No. 1, p. 681.

[3] American Journal of Obstetrics, May, 1908, vol. lvii, No. 5, p. 675.

[4] Archiv f. Gynäk., Band lxxxv, Heft 2, S. 372.

The vascular alterations are not characteristic, and depend upon the physiological alterations following pregnancy. He considers the question of whether the lesion is not less a uterine disease than one of a general nature, mentioning certain constitutional disorders as chlorosis, phthisis, typhoid fever, hemophilia, disturbances of the nervous system, hysteria, Basedow's disease, and conditions which increase the blood pressure, such as chronic nephritis, heart and liver disease, pelvic congestion, etc.

The anatomical alteration found in chronic metritis naturally produces mechanical conditions which favor hemorrhage, but the real cause of bleeding must be looked for elsewhere.

Ehrenfest[1] reviews the various theories which have been propounded to explain intractable uterine hemorrhage, and reports a case which he attributes to a nervous origin, no gross lesion of the uterus being found. Because of the unsatisfactory explanation of many of these cases on anatomical grounds, the author asks whether there may not be a metrorrhagia of nervous origin, and directs attention to literature which indicates an etiological relation between a direct psychic or an indirect reflex influence of the central nervous system and amenorrhea, menorrhagia, abortion, sudden cessation of labor pains, etc.

He quotes Monfalcon, Hewitt, Chiari, Kiwisch, von Rotterau, and others. The possibility of uterine hemorrhage being caused by a sudden emotion, continued depression, mental grief, or imagination is mentioned. Attention is drawn to the comparative frequency with which amenorrhea is attributed to psychic influences or anomalies, and to a scarcity of statement that these same influences might cause also uterine hemorrhages.

Several recent papers are noted which deal with nervous and hysterical menorrhagia and metrorrhagia; thus, Kroenig observed hemorrhage which was due to *hysteria* and became severe enough to require hysterectomy. The author believes that an impulse coming from the central nervous system may alter the normal function of the uterus in both menstruation and labor. The result may appear either as a vasomotor anomaly (amenorrhea, menorrhagia, and irregular hemorrhages), or as a motor disturbance (sudden cessation or sudden beginning of uterine contraction).

Any acceptable explanation of the exact mechanism by which a *mental* or a *reflex* cause could result in the sudden appearance or the sudden cessation of uterine hemorrhage must be limited to the following physiological and histological facts.

1. The blood circulation in the uterus to a very marked degree is under the influence of the vasomotor system, the uterus being an erectile organ.

2. The uterine muscle undergoes rhythmic spontaneous contractions.

[1] American Journal of Obstetrics, February, 1908, vol. lvii, No. 2, p. 161.

3. Changes in the tonus of both the uterine muscle and the vessel walls are subject to the influence of the central nervous system.

4. Uterine contractions at times (as when the impulse reaches the uterus by way of the nervi erigentes) is accompanied by active vasodilatation.

5. A sudden cessation of the menstrual flow or a temporary amenorrhea developing as the result of an emotion or in the course of certain diseases of the nervous system often cannot be attributed to organic lesions in either uterus or ovaries.

6. The sudden appearance of a hemorrhage caused by a mental shock cannot be explained, like the menstrual flow, as immediately due to certain degenerative processes in the walls of the endometrial vessels.

7. Arteriosclerosis, to a certain extent at least, must be considered physiological in the multiparous uterus.

He believes that tonic contraction of the uterus of nervous origin may be just strong enough to close the thin-walled veins without compressing the arteries, so that the endometrial vessels become engorged and sometimes rupture. Such hemorrhage is worse when the vessels are sclerosed or there is a dearth of muscular elements, because both mitigate against firm uterine contraction. This explanation of uncontrollable uterine hemorrhage is in full harmony, the author believes, with two of the theories extant, namely, arteriosclerosis and relative insufficiency of the uterine muscle.

Treatment of Uterine Hemorrhage. At the last meeting of the American Gynecological Society, Kelly proposed *vertical resection of the uterus* as a means of curing the intractable hemorrhages I have been discussing. At that time Martin announced that he had been carrying out the same idea for a number of years. The object of the resection is to reduce the extent of the endometrial surface from which hemorrhage takes place.

In a recent article, Dührssen[1] claims to have been the first to perform wedge-shaped resection of the uterine fundus for chronic metritis and also the first to perform hysterotomy for diagnostic or therapeutic purposes. He recorded it in his book, *The Limitations of the Abdominal Incision*, etc., published in 1898.

Resection of the anterior wall alone is sufficient to restore the uterus to the normal. By limiting the incision to the fundus, especially the anterior wall, the incision may be shut off from the general abdominal cavity by attaching the vesical peritoneum, while menstruation and the possibility of conception is preserved. When pregnancy is no more possible, he advises, in conjunction with resection, secure and direct vaginal fixation of the uterus with three catgut sutures. This cures the displacement which so often accompanies chronic metritis.

[1] Archiv f. Gynäk., Band lxxxv, Heft 3, S. 541.

Pfannenstiel also has excised a portion of the uterine wall in an endeavor to cure the hemorrhages, etc., incident to the so-called chronic metritis. One of his assistants, Cohn, discusses this operation which has been undertaken, in their clinic, for the most part in conjunction with operative measures for the relief of prolapse.

Cohn[1] asserts that in cases of prolapse following frequent childbirth there exists often a high grade of metritis. The latter causes a feeling of pressure and disturbance in menstruation, attributed by the patient to the very evident prolapse, but by the physician to the alterations in the uterus.

There is an etiological relationship between prolapse and chronic metritis. Edematous swelling of a prolapsed organ and hypertrophy of chronically irritated uterus have been noted. It is said that the edematous enlargement is temporary, and after the displaced uterus has been restored to position it disappears.

The truth is, however, that the uterine enlargement is frequently a true hyperplasia, not entirely dependent on the displacement, but existing as a more or less distinct affection.

A chronic fibrous thickening of the uterine wall and a temporary edematous swelling due entirely to prolapse may be differentiated. In the first, there is an actual hypertrophy of the uterine wall, affecting chiefly the connective tissue, which may precede the prolapse and even take a part in its production.

When chronic metritis is combined with prolapse, there are two operative indications: first, to restore the position of the uterus, and secondly, to cure the chronic metritis. If hysterectomy is done at once, a plastic operation is not apt to be satisfactory, and if vaginal fixation alone is performed, the metritis itself is not much benefited.

The solution of the problem has been found in the combination of aplastic operation, vaginal fixation of the uterus, and wedge-shaped resection of the uterine body. The first operation of this sort was done in November, 1903. Early in 1906 wedge-shaped resection came into general use, and 25 cases have been treated in this way.

The technique of the operation is easy. After amputating the cervix when it is hypertrophied, an oval flap is excised from the anterior vaginal wall from the urethra to the portio. When the uterine body is very thick, transverse incision is made in front of the cervix and the bladder separated from the borders of the vaginal denudation and the anterior face of the cervix.

After pushing up the bladder, a small speculum is introduced into the wound, putting under tension the connective tissue and vessels binding the bladder to the cervix on each side (the uterovesical ligaments). These are divided between clamps replaced by ligatures. After this

[1] Archiv f. Gynäk., Band lxxxiv, S. 244.

division, the bladder can be easily pushed upward and held out of the way.

The anterior surface of the uterus is caught with a tenaculum and delivered through the vagina. A wedge-shaped piece is now resected from the thickened uterine body by two sagittal incisions beginning at the fundus, passing through the anterior and posterior walls of the uterus, and converging about the position of the internal os.

The excised wedge varies in size, depending upon the degree of enlargement of the uterus. When the organ is reconstructed, it should be about normal in size. Hemorrhage during this procedure is free, but it comes from numerous small vessels, large ones not being cut if the incision does not extend beyond the internal os. A little traction on the lateral pieces of the uterus will diminish the bleeding considerably, and it will be still less if, before resection, a ligature is placed around the uterine end of each tube so as to catch the anastomosis of the ovarian artery.

The uterus is brought together either with a single layer of sutures, or, if the organ is thick, with one buried and one superficial row. The edges are very carefully approximated, beginning on the posterior wall at the lowest point of the incision, coming forward over the fundus to the lower end of the anterior incision. An effort is made to limit the number of sutures, but enough are used to secure complete hemostasis.

The reconstructed uterus is now fixed by the usual method to the vagina, the silkworm-gut sutures catching the uterus at about the height of the round ligaments and coming out close to the urethra through the borders of the vagina. The operative treatment is completed by the usual anterior and posterior colporrhaphy.

In 9 cases after operation the periods returned, for the most part regular and always less in amount than before the operation. In 3 cases there was but one extra-menstrual hemorrhage. In 12 cases the periods stopped completely. Among the 30 cases, in 3 there was a small solitary myoma, and in 5 a number of small, partly intramural, partly subserous myomata. They were situated usually in the area to be resected; when they lay to the side of it they were enucleated from the surface of the incision with ease. During the first days of convalescence there is an elevation of temperature. It has been observed in almost half of the cases, and is regarded as harmless and due to resorption. In 14 the convalescence was entirely smooth and without elevation of temperature. The ultimate result was good in all cases.

Atmocausis.—Atmocausis, either alone or in conjunction with curettage, has been recommended by some gynecologists as an efficient means of curing *myopathic hemorrhage*. The method has not come into very general use in this country, and I have always regarded it with disfavor.

Frankenstein[1] gives the experience they have had with atmocausis in the clinic at Kiel.

[1] Monatsschrift f. Geb. u. Gynäk., October, 1908, Band xxviii, Heft 4, S. 396

The observations covered a period of about seven years. The author has been able to follow up about 86 per cent., and he personally examined 112 of the cases. In 92 instances he had to be satisfied with a communication.

The author believes that the bad results reported by many writers were due to a faulty technique. A curettage should precede atmocausis. There should be no metal tips to the apparatus, and the duration of the application should not exceed thirty to thirty-five seconds, and the kettle temperature, 117° to 122° C. Only 21 cases are taken from the last year's experience, and of these, but 8 during the last half of the year; no case was observed for less than three months. The average age of the patient was 44.2 years. This fact corresponds to the conclusions of Baisch that atmocausis is principally useful in climacteric and preclimacteric bleeding. Twenty-nine cases were fifty years old and over. There were 11 younger women in whom profuse hemorrhage, in spite of repeated curettage, made atmocausis imperative. Eleven patients were under thirty-five years. In young women, atmocausis may lead to a cessation of the menses from total or partial obliteration of the uterine canal, so that it should never be used in this class of patients except as the ultimate resort and as a substitute for hysterectomy. Concerning the primary result of vaporization in 223 cases, 218 had an entirely uneventful convalescence without any rise of temperature. No vaginal douches were given during convalescence. In five cases there were complications; two were associated with myoma; the third case had an embolus to the brain; the fourth suffered from bronchitis, and the fifth died from pleurisy and heart failure. An unfavorable primary result was experienced, therefore, in 1.3 per cent. of the cases. The permanent result was disappointing in 15 (7 to 8 per cent.), the patients being no better, or requiring another operation.

In 82 cases (42.7 per cent.), or about half, the procedure was followed by the appearance of the menopause; in 46 women (24 per cent.) the menopause occurring after a longer or shorter interval. The duration of postoperative amenorrhea varied between two months and five years. It averaged somewhat over five months. The results in 157 (81.7 per cent.) of the patients were satisfactory; 12 (6.2 per cent.), although they were freed from profuse bleeding and looked better, still complained; 8 patients felt worse than before.

In closing, the author insists that the chief domain for atmocausis is in women approaching the menopause who have hemorrhage due to chronic metritis. It is only exceptionally indicated in young women, and then only when life is threatened and when the choice of procedure lies between vaporization and hysterectomy. It should not be used in myoma cases unless they are small and lie within the uterine wall (interstitial). Schaller[1] says that it is hard to regulate the degree of

[1] Deutsch. med. Woch., August 6, xxxiv, No. 32, p. 1392.

vaporization, and that bad results will be encountered. Its principal indication is in the treatment of preclimacteria hemorrhage as a substitute for hysterectomy.

Cramer[1] reports a death following atmocausis from infection of the cauterized tissue. Every antiseptic precaution had been observed.

Dysmenorrhea. Fraenkel[2] reports 25 new cases in which the menstrual periods were considerably influenced by the use of the *x*-ray. In some of them the patients were treated for other diseases, and it was incidentally observed that their periods became less profuse, or less frequent, or less painful. In others, the "rays" were deliberately used for the correction of menorrhagia, metrorrhagia, dysmenorrhea, and leucorrhea.

The best time for using the "rays" is immediately after or at least during the first two weeks following a period. A start must be made at this time, and two or three given during the second half of the intermenstrual interval.

The treatment is painless, unassociated with danger, and certain in its results.

Eisenstein and Hollos[3] observed 118 menstruating women giving a positive tuberculous reaction and exhibiting physical symptoms of *tuberculosis* in a large majority of cases. Only a few of them had a regular, painless menstrual flow; 70 suffered with dysmenorrhea; 14 had partial or complete amenorrhea. In a large number the duration of menstruation was increased, and the flow appeared too frequently.

Of the 70 women who suffered with dysmenorrhea, 53 were treated with tuberculin. In only 8 of the 53 did the pain continue unaffected by the treatment; 40 were practically relieved of pain.

Herzl[4] gives his results with the use of a posterior sagittal *incision of the cervix* in the treatment of dysmenorrhea from stenosis of the cervical canal.

The posterior lip is divided up to the internal os. If the cervix is very thick, a V-shaped piece is excised from the cervix wall on either side of the incision. This is not necessary when the cervical wall is thin. It is very important to carefully unite with sutures the mucosa of the cervix and that of the vagina over the raw edge of the cervical incision. It is especially important to attach the cervical mucosa to that of the vagina at the very upper limit of the incision. The author uses catgut exclusively and places a strip of gauze in the uterus, allowing it to remain for forty-eight hours. Sterility is another indication for this operation, especially when it is associated with a sharply anteflexed hypoplastic uterus. It is, of course, not recommended for cases in which there is any

[1] Monatsschrift f. Geb. u. Gynäk., Band xxvii, Heft 3.

[2] Zentralblatt f. Gynäk., February 1, 1908, No. 5, p. 142.

[3] Ibid., October 31, 1908, No. 44, p. 1441.

[4] Zeitschrift f. Geburts. u. Gynäk., Band lxii, Heft 3.

other cause for the dysmenorrhea or the sterility. The patients whose cases he reports were not operated upon when they first consulted him, but for a while conservative treatment was adopted, bearing in mind the general mental and physical condition.

In only 27 cases was it possible to determine the subsequent history of the patients operated on by the method in question: 19 of the cases were acute anteflexions of the uterus, 11 had in addition or alone a parametritis posterior; in 5 cases sterility was the chief complaint; the other 22 suffered from painful menstruation. These were all clinic cases, but 13 private cases of Lott's may be added, so that the entire number is 39.

Complete relief from the painful periods was obtained 16 times (61 per cent.) in the clinic cases and 12 times in Lott's private cases, giving a total of 28 favorable results (71 per cent.). The good result not only affected the pain associated with menstruation, but also the regularity and duration of the menstrual flow. A part of this action must be ascribed to curettement, which was always carried out before the operation. The operation was without benefit in 13 cases (7 per cent.).

The cases treated for *sterility* resulted as follows: One patient gave birth to a child; one is now pregnant, although she had been sterile for six years of married life before the operation. In one case the operation was badly carried out. In one chronic alcoholism most likely exerted an unfavorable influence upon the possibility of conception. In three of Lott's cases pregnancy occurred, one after seven years, one after eleven years, and another after thirteen years of sterility.

Kermauner[1] believes the source of pain in many cases of dysmenorrhea is in the pelvic connective tissue, which is richly supplied with nerves, especially the sacro-uterine ligaments.

Sellheim,[2] after noting Lennander's assertion that the *parietal peritoneum* alone is sensitive to pressure in pelvic operations under local anesthesia, believes it plausible that certain forms of dysmenorrhea may be referred to the peritoneum. The mechanics of a peritoneal tugging in cases complicated by adhesions or inflammatory lesions of the adnexa is easy to appreciate. The natural connection between the adnexa and the parietal peritoneum through the infundibulopelvic, ovarian, and the sacro-uterine ligaments makes possible a certain amount of tugging on the parietal peritoneum, even though no adhesions exist.

In many patients who suffer with dysmenorrhea, especially in those with ill-developed genitalia, one or other of the ligaments, mostly the sacro-uterine, is thick, short, and dense. That pulling on them may cause pain can be demonstrated by rectal examination, hooking a finger around the ligament and drawing it forward. This pain is often said to be exactly like the dysmenorrhea complained of, or at least to resemble it.

[1] Monatsschrift f. Geb. u. Gynäk., Band xxvi, Heft 5; Abstract in Journal of Obstetrics and Gynecology of British Empire, April, 1908, vol. xiii, No. 4, p. 286.

[2] Ibid., June, 1908, Band xxvii, Heft 6, S. 681.

Sellheim thinks that his observation is substantiated by the temporary relief which he finds sometimes follows digital stretching of the sacro-uterine ligaments; also by the relief where pregnancy and labor has well softened and stretched the ligaments.

In his opinion there is a direct connection between abnormal anteflexion and kinking of the cervical canal, and abnormal shortness and stiffness of the sacro-uterine ligaments. These dense ligaments draw the isthmus posteriorly, while the fundus is held forward by the round ligament, and the vaginal cervix is held forward by the vagina. Many cases of dysmenorrhea in which an abnormal denseness of the uterosacral ligaments is attributed to constipation are cured or relieved by regulation of the bowels.

In treating dysmenorrhea, the author directs his attention to these ligaments, employing an electromagnet on the surface of the abdomen, which alternately pulls upon and releases suitable iron rings or cones in the vagina. This form is superior to the digital form of massage, principally for esthetic reasons. He has tried incision of the uterosacral ligaments in one case. The patient was improved for a while, but the old pain returned, and with it pain in the abdominal incision, where nothing abnormal could be found.

Sterility and Amenorrhea Associated with Obesity. Rothrock,[1] after studying carefully a number of cases coming under his observation, has been impressed with the possibility that in some of them the cause may be found in disturbed function of the ovaries, due to degenerative changes in their structure, which must be regarded as primary.

It has long been known that antagonistic nutritive relations exist between obesity and the functional activity of the sexual organs. Oertel calls attention to the observation that in men in whom sexual activity ceases early, or who have become impotent from any cause, or who have undergone castration, there is frequently a rapid increase in the formation of fat. The same observation holds good in domestic animals, and castration has long been practised on those intended for slaughter.

In women there is usually an increase of weight after the menopause, and an analogous increase has been observed in young women in whom the ovaries had been removed. According to Glaevecke, 75 per cent. of such women showed an increase in weight a year after the operation. In one-third of this number the increase was slight. Pfister, observing 116 cases, noted an increase in weight in 52 per cent. A similar increase has been observed in women in whom the ovaries had become partially or wholly disorganized, as from long-standing chronic inflammation with subsequent cyst formation.

Clinically, obesity which is associated with amenorrhea and sterility is divisible into two well-defined groups. First, women in whom the obesity

[1] Medical Journal, February, 1908, vol. x, No. 2, p. 70.

becomes manifest in childhood or adolescence, and second, women in whom these symptoms begin after the birth of one or more children, usually not before the third decade of life.

Examination of the first group shows that in a large proportion the genital organs are undeveloped, the infantile type of uterus persists, and the ovaries are small. In the second group, especially in women who have given birth to several children in quick succession, there is often atrophy of the uterus, with accompanying senile changes in the ovaries. It is to the latter that attention is particularly called, inasmuch as in the former the obesity usually begins before the ovaries are functionally mature and because undeveloped organs of generation are quite as frequently dissociated with obesity.

Frommel, in an excellent paper on "Puerperal Atrophy of the Uterus," describes a form caused by severe puerperal disease of the ovary or the uterus, such as suppurative oöphoritis, metritis, and endometritis. This group of cases was composed of young women who appeared to be in good health; who, instead of being emaciated, were well nourished and inclined to obesity. Frommel, among 5000 gynecological cases, observed 28 of this description, whose ages ranged from nineteen to forty years, the average being twenty-nine years. Most of these patients suffered from indefinite pain in the abdomen, backache, and other symptoms of probable hysteric origin. Careful examination showed atrophy of the uterus in all, the organs measuring not more than 5 or 6 cm. in length. In only 3 of the 28 cases were the ovaries normal in size, and 2 of them were fixed by old inflammatory adhesions.

Retroposition of the Uterus. Olshausen[1] points out that the retroposition of the uterus following childbirth almost invariably occurs in the first puerperium.

Hancock[2] believes that retroversion should be actively treated whether manifesting symptoms or not.

Kustner[3] does not believe in neglecting a freely movable retroversion. He says that such a retroversion may be compared to the dislocation of certain abdominal organs, such as the stomach, the kidney, the spleen, and the colon. The most frequent symptoms of retroversion in an early stage are leucorrhea and menorrhagia. The classical symptom of backache is not unfrequently absent. There may be pain in one or both hypogastric regions, and on the right side it is often mistaken for appendicitis. The simplest and best treatment is replacement of the uterus and the use of a pessary, and this applies either to the married or to the unmarried. If the pessary does not cure, then an Alexander operation should be done.

Operation is not indicated immediately, because none of the opera-

[1] Zentralblatt f. Gynäk., January 4, 1908, No. 1, p. 1.

[2] Medical Record, March 7, 1908, vol. lxxiii, No. 1, p. 396.

[3] Med. Klinik, April 12, 1908, No. 15, p. 523.

tions which have been devised are altogether satisfactory. The presence of adhesions is not always to be inferred from a failure to replace the uterus without anesthesia.

When light adhesions are present, involving the uterus especially, they may be forcibly broken by Schultz's method, and a pessary may be used afterward. If after replacing the uterus a pessary causes pain, it becomes evident that inflamed and tender parts are being pressed upon and torn, so that its discontinuance is advisable. When adhesions involve the adnexa and are very dense, it is dangerous to break them by Schultz's method or by massage and operation is necessary.

Boldt[1] thinks that too little attention has been paid to the treatment of retroposition of the uterus by means of a *pessary*. There are some patients who object to operation and others whose physical condition makes operation unsafe, in many of whom properly selected mechanical support will entirely relieve the symptoms.

No operation is entirely free from risk, and if in a given case the desired result may be achieved by an entirely safe method, then it should be for the patient to decide which she prefers—the palliative method, with the possibility of a permanent cure and without any of the risk entailed by the surgical intervention, or the operative method, with its almost certain cure and attendant risk.

A pessary which has been properly fitted need not be removed oftener than once in five or six months. He advises plain water or a saline douche every day. The patient should be told that for permanent cure the support must be worn from two to five years. From 20 to 25 per cent. of uncomplicated movable downward displacements of the uterus can be permanently cured by such therapeutic measures.

Strassmann[2] also believes that one-fifth of all cases of retroversion can be cured by the pessary. There should be no operation unless the pessary fails to give relief.

Polak[3] draws attention to the lack of distinction between *ventrosuspension* and *ventrofixation* in the reports of labor following these operations. In Lynch's report of 1904, only two of the 21 cases of Cesarean section followed a suspension operation. Eighteen were deliberate fixations, and in the nineteenth there is some doubt as to the character of the original operation. In Noble's exhaustive review, in 1896, no distinction was made. Andrews, in 1905, made none. The cases of Cesarean section reported by Hurdon and Williams in 1906 followed fixation operations. Humpstone reports three Cesarean sections, all of which were done after ventrofixation.

Before condemning suspension, the unprejudiced observer stops to

[1] Journal of the American Medical Association, September 12, 1908, vol. li, No. 11, p. 903

[2] Berliner klin. Woch., November 3, xlv, No. 44.

[3] Surgery, Gynecology, and Obstetrics, July, 1908, vol. vii, No. 1, p. 29.

consider the thousands of suspensions done every year by various operators and the small number of complications reported. Polak's defense of the operation is based upon a personal experience of 687 suspensions. The technique of Kelly has been somewhat modified in his clinic by the substitution of ten-day chromic gut for the silk suspension suture, and he does not catch the uterus quite as low on the posterior wall. The patient is put to bed in the elevated trunk posture, which directs the intra-abdominal pressure against the posterior uterine wall. Special care is taken not to scarify or irritate the point of attachment.

The bladder is emptied frequently with a catheter until the patient is able to void urine, and the tension of a heavy uterus on its delicate suspensory adhesion is minimized by the introduction of a properly fitting Byrne retroversion pessary, unless a plastic operation has been done at the same sitting. All of the patients are made to wear a pessary for some months following the operation, or until the size of the uterus has become reduced. He thinks this little point in detail explains the freedom of recurrence in his experience, only eight relapses occurring in 301 private patients; 178 of these private patients were in a position to conceive; 34 pregnancies followed; all labors were attended by the author; 2 women miscarried at the fourth month; in one abortion was induced on account of pernicious vomiting; in the other, a high amputation of the cervix had been performed.

There was but one malpresentation in the series, and this was a breach which terminated in spontaneous delivery at the eighth month. Forceps were used but twice, the indication in both patients being a slow second stage with an imperfectly rotated head on the pelvic floor. As the position of the fetus in both of these cases was a posterior one at the beginning of labor, and both women were primipara, he did not feel that the dystocia necessitating forceps was due in any way to the suspension. In 31 cases the head presented in one of the vertex positions; 29 of the women delivered themselves without difficulty or intervention, the character of the labors differing in no way from the normal.

One point at variance with the reports of other observers impressed the author, namely, that the presenting part descended into and became engaged in the pelvis early, often a week or two before labor occurred. Eighteen pregnancies and labors were reported, but not attended by the writer. In this series there were no abortions and no malpresentations. In one case axis traction forceps was necessary. This was an occiput posterior position.

Polak has had occasion to examine 47 of the 52 women who became pregnant and were delivered subsequent to the suspension. In only 4 had the uterus relapsed into retroposition; 2 of these, as has already been stated, could be and were replaced. This is no larger proportion of displaced uteri than follows labor in women who have had no operation for the correction of a displacement.

Polak's results with ventrosuspension are superior to those he has obtained with the Alexander, Mann, or Gilliam operation. Each of these operations has been tried in 30 to 40 patients, and the results have been carefully noted. His opinion of ventrosuspension is in accord with that of Holden, of the Johns Hopkins clinic, who reported 83 labors following suspension, and that of Beyea, who reported 42.

Treatment of Ruptured Tubal Pregnancy. There has been considerable discussion recently whether to operate immediately for a ruptured tubal pregnancy or to wait for reaction. Robb and Simpson have advocated an expectant plan, which I detailed in PROGRESSIVE MEDICINE last year. These authors, as the result of actual trial, experiments, and reasoning, believe that a patient suffering from intraperitoneal hemorrhage will not die from loss of blood if kept absolutely quiet and undisturbed. They advocate operation, but not until the hemorrhage has ceased and the patient has begun to react. They argue that hemorrhage is greatly increased or started afresh by pelvic examination, transportation to an operating room, etc., and that the additional shock of an operation at this time may prove fatal.

Vineberg,[1] discussing the relative advantages of immediate and delayed treatment, and referring especially to the analogy drawn between hemorrhage in ectopic pregnancy and in gastric and typhoid ulcer, says that the mortality of acute large hemorrhage in gastric ulcer is placed by Musser at 22.4 per cent. Furthermore, Osler, quoting the results of 2000 autopsies on typhoid patients in Munich, stated that death occurred from hemorrhage in 99 cases, or over 20 per cent. It was the cause of death in 11 of 56 fatal results in Osler's practice.

In the vast majority of cases of intraperitoneal hemorrhage from tubal rupture or abortion, it matters little whether operation is done at once or deferred for a few days. In what may be called cataclysmic cases, immediate operation with intravenous saline infusions will be attended with better results than when the operation is deferred.

Ladinski[2] believes that in comparing deferred with immediate operation the only data which can be relied on must be obtained from patients in whom the diagnosis has been established at operation. The number of deaths in cases treated by operation should be compared with the fatalities in those treated expectantly, the diagnosis having been corroborated by a subsequent operation. Ladinski has not met with a death which could be ascribed to immediate operation, but he is convinced that he has seen death occur from delay.

Stillwagen,[3] who is a believer in the expectant treatment, asserts that he has observed alarming recurrent hemorrhage, brought on by the manipulations of the attending physician, after the primary hemorrhage ceased.

[1] Surgery, Gynecology, and Obstetrics, July, 1908, vol. vii, No. 1, p. 79.

[2] American Journal of Obstetrics, 1908, vol. lvii, No. 1, p. 55.

[3] Ibid., January 1908, vol. lvii, No. 1, p. 43.

Although fatal collapse from hemorrhage and shock following the rupture of a pregnant tube does sometimes occur, it is undoubtedly rare. Formad reported 1 per cent. in 3500 general autopsies. But he asks, "Do they actually bleed to death?" The shock and collapse occur almost simultaneously with the rupture, before there is time for a great deal of hemorrhage, and the gravity of the symptoms is usually out of all proportion to the amount of blood lost.

Surgeons will agree that it is difficult to conceive of more unfavorable conditions under which to enter the peritoneal cavity than already exist when there is profound shock and the pelvis is filled with blood. Granting that it is possible to carry out rigid asepsis, in spite of the haste and the difficulties with which these operations are performed, and that the blood is not a menace as a culture medium for the organisms which may be introduced at the time of operation, there is nevertheless a risk of infection from the tube itself. It is generally conceded that salpingitis is the most important factor in the etiology of ectopic pregnancy. Marked symptoms of infection and localized peritonitis within twenty-four to forty-eight hours after rupture sometimes occur, and it is not remarkable that many cases which survive the shock of operation succumb later to sepsis. In 34 fatal operations in which the cause of death was given, sepsis occurred 14 times.

In the face of such dangers, how often is it justifiable to operate? It has been determined that about 75 per cent. of all cases of ectopic pregnancy terminate in tubal abortion. The product of conception is expelled from the fimbriated extremity of the tube, the bleeding is not usually great, and the entire mass is walled off quickly by adhesions. There could certainly be no objection to delay in these cases. Of the other 25 per cent., a certain number rupture into the broad ligament, which is the safest of all terminations. The balance, probably not more than 20 per cent., rupture directly into the peritoneal cavity.

Robb[1] says that not more than 5 per cent. of the victims of ectopic pregnancy die at the time of rupture, whereas after immediate operation the reports of 1176 cases in 25 clinics show a mortality of 8 per cent.

Robb[2] also reports further experiments in the study of hemorrhage following section of the uterine and ovarian vessels in dogs and its possible bearing on ruptured tubal pregnancy. Thirty-one experiments have been made to date. The first report of Robb on this subject was reviewed in Progressive Medicine for March, 1908. There have been a number of interesting experiments since that time.

In one dog (No. 7) the right uterine vessels were cut and the abdominal cavity was temporarily closed by clamping the edges of the peritoneum. At the beginning of the operation the pulse rate was 128. The dog was

[1] Journal of the American Medical Association, 1908, vol. xxi, No. 21, p. 1767.

[2] American Journal of Obstetrics, October, 1908, vol. lviii, No. 4, p. 577.

kept under light anesthesia. Fifty minutes after the pulse was 136, and thirty minutes later, 156. The peritoneum was reopened and the blood in the pelvis carefully removed with gauze sponges. Gentle pressure on the cut end of the artery with a gauze sponge stopped the bleeding in about ten minutes. Twenty minutes later a subcutaneous infusion of salt solution, 400 c.c., was given. This was nearly all taken up in thirty minutes. It was given to see if the subsequent rise in the blood pressure would bring on a recurrence of hemorrhage from the uterine artery? No such effect was produced at the end of thirty minutes after the absorption of the saline solution. The injection seemed to exercise a general beneficial result, and the experiment would tend to refute the idea that subcutaneous saline infusions are dangerous after hemorrhage has ceased unless an operation is performed and the vessels are tied.

In another dog (No. 14) the right uterine vessels were severed and the abdomen was closed while the vessels were bleeding. After an interval of thirty-five minutes the pulse was 204; after falling to 140 the abdomen was opened a second time and the vessels tied, the manipulations being like those employed in operation for a ruptured tubal pregnancy. Thirty-five minutes after the dog expired either from the effect of the operation or of the anesthetic, or from a combination of these factors. This experiment, while only a single observation, is at least suggestive that the addition of shock to shock, which is precisely what is brought about when a woman is submitted to an immediate operation for ruptured tubal pregnancy, is very likely to prove fatal.

Robb endeavored to trace some connection between the pulse and respiratory rate and the percentage of hemoglobin on the one hand and the formation of a blood clot or the cessation of bleeding on the other. In the first dog of the series, eight minutes after the left uterine vessels had been cut, the pulse had risen from 200 to 240, and the respirations were 52. Twenty-three minutes after the severance of the vessel the hemoglobin had fallen twenty points, but when taken fifteen to thirty minutes later the hemoglobin showed the same reading. After the hemoglobin ceased going down the pulse and respirations began to improve, the pulse going to 154 and respirations to 24. On reopening the abdomen a number of clots were found lying between the intestines and the bladder and around the cut ends of the vessels.

Similar experiments have been carried out frequently enough in dogs to make Robb feel reasonably certain that from the hemoglobin readings alone one can tell the time at which a clot has formed in the vessels. In every instance in which the hemoglobin ceased to go down and the reading remained stationary (and this in his experience always eventually occurred) a well-formed clot was found occluding the vessels upon reopening the abdomen.

Robb believes that the hemoglobin readings will be found very useful in cases of intra-abdominal hemorrhage from a ruptured ectopic preg-

nancy, and that when the hemoglobin remains stationary, one may feel confident that it is best for the patient not to operate at once.

In another series of experiments Robb made observations on the pulse, respiratory rate, and hemoglobin before and after bandaging or applying weights to the lower abdomen. In all cases the pressure seemed to exercise a beneficent effect, causing a cessation of hemorrhage and the formation of clots. The results suggest the application of pressure over the lower abdomen in cases of hemorrhage from ruptured ectopic pregnancy. The idea might be carried out by the use of shot or sand bags of known weight, as much weight being employed as the patient can stand with comfort.

As the result of his experiments, Robb believes that intra-abdominal hemorrhage from ruptured tubal pregnancy is not sufficient in itself to cause a fatal termination. Death may be caused, however, by the shock which attends the various procedures adopted in the way of treatment. He believes that the experiments were sufficiently severe to more than equalize the greater resistance to the loss of blood in a dog as compared with a human being under fairly similar conditions.

Clotting probably occurs within fifteen to twenty minutes, and it can be gauged by a cessation in the fall of the hemoglobin percentage. Manipulation of the tissues at this time by disturbing the clot causes a recurrence of the hemorrhage.

The observations of Robb are of great value, and by making analogous observations in man the surgeon may find a reliable indication of continuing or subsiding hemorrhage. I do not believe that the operative or the conservative plan should be applied by rule to all cases. If the patient is *in extremis*, then as little disturbance as possible, following Simpson's ideas, with gradual stimulation and delay until reaction has occurred, is certainly the most logical plan. If a case is seen immediately after rupture, and the patient's condition is not so bad that the added shock of operation appears probably fatal, and if the facilities for operating are first class, then I would advise immediate celiotomy and removal of the pregnant tube. It is unwise to become an unreserved adherent of either plan, but I believe that Robb and Simpson have performed a distinct service in showing that desperate cases may be treated safely by conservatism.

Ovarian Tumors. Bland-Sutton[1] considers *primary cancer of the ovary* a rare disease, and thinks that it is often secondary to small carcinomas of the gastro-intestinal tract or the gall-bladdeer. He thinks there is something favorable in the structure of the ovary which permits a metastatic carcinoma to attain a large size.

He would not accept any case of cancer of the ovary as primary merely on the laboratory report. It is necessary to supplement the

[1] British Medical Journal, January 4, 1908, vol. i, p. 5.

microscopic examination of the tumors by a statement that the operator carefully examined the gastro-intestinal tract, the gall-bladder, and the mammary gland to assure himself that these structures did not contain a primary focus.

Bland-Sutton[1] says that the first object of the surgeon in removing *ovarian cysts* should be to avoid contamination of the peritoneum with the harmful, dirty, and septic material these tumors often contain.

He has seen many a life lost from this accident, and he has seen cases also in which the dissemination of particles from a malignant tumor has been followed by a rapid growth of the disease throughout the abdomen and death. He believes in a long incision—sufficiently long to remove the tumor entirely. This he has practised for the last ten years. The long incisions heal rapidly and soundly, and in his experience a yielding cicatrix is more common in a short incision than in a long one.

Schmidlechner[2] gives the immediate and remote results of operation for malignant and doubtful tumors of the ovary; 24 cases of carcinoma of the ovary were operated upon between 1880 and 1890; 6 died from the operation, 1 died during convalescence from some intercurrent disease, 12 died later, and 2 were cured after five years; the fate of 3 is unknown. The author reckons his percentage of cures from the 14 patients who survived the operation and were kept under observation. He gives the percentage of absolute cure as 14 per cent. (according to our own estimation the percentage of final cures was $8\frac{1}{3}$ per cent.). It can be seen that the prognosis for absolute cure after operation for cancer of the ovary is quite unfavorable. The patient comes to operation relatively late, and the outlook is bad. The effort should be made to recognize these cases early. While a certain group of operators demand the removal of the second ovary and the uterus, the author considers it good practice to leave the uninvolved ovary and the uterus, if they appear healthy in the young childbearing woman. Twenty-four patients were operated on for *sarcoma of the ovary* between 1880 and 1890. Seventeen remain permanently cured (70 per cent. according to our reckoning, but the author, excluding cases dying after the operation and those lost sight of, puts it at 85 per cent.). The prognosis is much better than in carcinoma. Hofmeier considers these cases of doubtful malignancy, and thinks it is unnecessary to remove the second ovary if it appears uninvolved. To this view the author assents. Pfannenstiel, however, recommends a complete radical operation. Forty-nine cases of adenocystoma serosum were operated on between 1880 and 1900. Thirty-three were permanently cured (67 per cent. according to our calculation, but according to the author's, who excluded primary mortality and cases lost track of, $82\frac{1}{2}$ per cent.).

[1] Journal of Obstetrics and Gynecology of the British Empire, February, 1908, vol. xiii, No. 2, p. 108.

[2] Monatsschrift f. Geb. u. Gynäk., July, 1908, Band xxviii, Heft 1, S. 1.

Pfannenstiel removes both ovaries without respect to the age of the patient, unless there is a desire to retain the power of reproduction. In bilateral tumors the uterus and the adjacent peritoneal surfaces must be removed. Hofmeier is satisfied with the removal of the diseased ovary, but keeps the patient under careful supervision to detect a later involvement of the second ovary in its earliest stage. The prognosis of bilateral cases is not so very bad, and they may even get well when the peritoneum has been affected. Six out of fifteen such cases were cured.

Ovarian Transplantation. Martin[1] reports five cases of the reimplantation of a piece of an ovary after it had been removed by a radical operation. This he calls homotransplantation. He also reports three cases of heterotransplantation, in which an ovary removed from one individual was transplanted into another. The cases of heterotransplantation gave him an excellent opportunity to observe the behavior of ovaries transplanted from one female to another in whom a complete artificial menopause had become established because of the absence of ovarian tissue. In two there was unquestionably a revivifying influence upon the menstrual apparatus, as shown by the appearance of a vaginal discharge at intervals of thirty days for a considerable period and the discharge of blood on several occasions. The nervous symptoms of the artificial menopause were promptly eliminated in one case. The third case did not report. Four of the cases of homotransplantation reported regular and apparently normal menstruation. The fifth case did not report.

The author reviews the literature of the subject, reporting his cases and technique in detail, and concludes that the operation of homo- or heterotransplantation of the ovaries in women is no more dangerous than small plastic operations on the appendages. Homotransplantation will prevent, as a rule, the atrophy of the genitalia which usually follows castration, but it has not yet been demonstrated that heterotransplantation will do this or give permanent relief from the nervous symptoms of an artificial menopause. Conception and menstruation have continued in women after homotransplantation. Conception has been reported following heterotransplantation (Morris).

Heterotransplantation should be done as soon as possible after the receptor's ovaries have been sacrificed, before the menopause has become established and the genitalia atrophied.

Gonorrhea in the Female. Gonococcus infection of the female genital organs is a subject of perennial interest. It has long been a moot point how frequently this disease occurs in the married woman and what proportion of men who marry have previously had a Neisserian infection. I gave last year the very logical conclusions of Erb, who disagreed with Blaschko upon the frequency of gonorrhea in men.

[1] Surgery, Gynecology, and Obstetrics, July, 1908, vol. vii, No. 1, p. 7.

Forchheimer,[1] after making an investigation of three generations of certain families known to him, in regard to the frequency of gonorrheal infection, and after certain statistical studies, comes to the conclusion that the morbidity of gonorrhea (outside the army and navy of the United States) is diminishing.

Not more than 54.1 per cent. of males have had gonorrhea during their lifetime. His general conclusions are about the same as Erb's.

Bandler[2] speaks of the ease with which gonorrhea is recognized in the male and the difficulty with which the diagnosis is sometimes made in the female. He draws attention to the fact that in women the urinary and the genital organs are separate, and that the involvement of one may be independent of the other or be of a different degree of severity.

A subacute gonococcus invasion frequently attracts no attention at all, and even an acute localized involvement may cause such slight annoyance that medical attention is not sought.

There is a strong tendency to heal without treatment in from six to eight weeks, and all the subjective symptoms may disappear. A small purulent discharge may persist from the urethra because of deep involvement of the urethral mucosa or a urethral gland. A chronic urethritis may always be looked upon with suspicion, irrespective of microscopic findings, if it affects a nulliparous woman in whom septic involvement of the urethra can be excluded, or one who has not been exposed to the possibility of a catheterization cystitis or had a fistula.

Rectal involvement is by no means rare and is very difficult to recognize positively. The patient usually complains of a sensation of heat and burning increased by defecation. Fissures often exist.

Gonococcus infection in children is frequently overlooked, and every attack of peritonitis in female children which simulates appendicitis should have the gonorrheal possibilities excluded.

An ascending gonorrheal infection may take place during the puerperium with few or no symptoms. Persistent routine examination of puerperal women often shows the gonococcus in the lochial discharge, even when there is no rise of temperature. Such an afebrile involvement may result in the so-called "one-child" sterility from anatomical changes in the tubes.

While it is well recognized that abscess of Bartholin's gland is commonly gonorrheal, the author draws attention to the less-known fact that cysts of the gland of Bartholin, in which the accumulation contains no gonococci, may have been produced by a previously existing gonorrheal inflammation of the duct.

He believes that cervical erosions plus a pathological cervico-uterine discharge in nulliparæ is presumptive evidence of a gonococcus infection.

[1] Boston Medical and Surgical Journal, August 6, p. 161.

[2] Journal of the American Medical Association, February 1, 1908, vol. l, No. 5, p. 335.

Such an infection also is the cause of a goodly proportion of cases of tubal pregnancy.

There are three reasons for the failure to recognize the forms of gonorrhea mentioned. Either the original gonorrheal infection was so situated as to cause bearable annoyances, as is often the case with gonorrhea of the urethra and involvement of the cervix if both remain localized; or the situation of the infection is unusual and the symptoms resemble those of other diseases; or the original infection was of so mild a character that it did not attract the attention of the patient.

While it is well to bear in mind the possibilities of overlooking the gonococcus origin of certain pelvic disorders, I would not be so much inclined as Bandler to take it as granted without confirmative microscopic evidence. This opinion is rather strengthened by the statement of Gurd,[1] who believes that the gonococcus can be isolated and identified by cultivation when present. He thinks the examination of smears by Gram's method is of little use and the staining of smears by any other method is of no value whatever. In his opinion at least 50 per cent. of women attending gynecological clinics have gonorrhea.

Treatment. Bierhoff[2] believes that abortive treatment is only justified when the infection is recognized in its very earliest stages and is distinctly limited to the urethra, Bartholin's glands and the cervix not being involved.

The author in such cases has employed with success the following procedure: He irrigates the meatus, the urethra, and the surrounding parts with a $\frac{1}{4}$ to $\frac{1}{2}$ per cent. solution of protargol. Either a hand syringe or an irrigator may be used, but there must be no great degree of pressure. In all, about 150 c.c. are required for the urethra and its surroundings.

About 150 c.c. of the fluid are injected through the urethra into the bladder. In order to do this, the patient is instructed to relax the muscles, when the urethra feels distended, as if about to urinate, whereupon the fluid will flow easily into the bladder. The entire amount is allowed to remain for a few minutes and is then expelled. The vulva is cleansed, using for this purpose about 150 c.c. of the solution. A vaginal scraping is then made and examined.

The nozzle of the syringe is gently inserted into the vagina, with the solution flowing, and the outlet is blocked to prevent the escape of the injected fluid, until the vagina becomes distended, when the solution is allowed to flow out. About 300 c.c. are used for this vaginal cleansing.

A sterilized speculum is inserted into the vagina—preferably of the duckbill type—and the vagina, particularly the fornices and the cervical orifice, cleansed by gently wiping with little cotton pledgets.

[1] Journal of Medical Research, May, p. 291.

[2] New York Medical Journal, January 11, 1908, vol. lxxxvii, p. 60.

A specimen of the cervical secretion, or a scraping from the cervical canal, is now made with the sterilized loop, and examined microscopically. The vagina is lightly tamponed with several yards of narrow absorbent gauze strips, saturated in 5 per cent. protargol solution.

A soluble urethral bougie of 5 per cent. protargol in cacao butter, an inch and a half long, is inserted into the urethra and retained by a pad of absorbent cotton, saturated in 1 per cent. protargol solution, placed over the urethral and vulvar orifices, and held with a "T" bandage. The patient is instructed to resist the desire to urinate, if possible, for several hours, so that the drug in the melting bougie may be kept in contact with the urethral mucous membrane for a considerable period. The pad covering the vulva is kept moist with the 1 per cent. protargol solution.

Rest in bed is of advantage in the treatment. Bland diet should be ordered, all intoxicating or carbonated drinks avoided, and all highly spiced articles of food omitted from the dietary. A daily warm sitz bath, in the evening, completes the treatment.

The vaginal tampon is left in place for twenty-four hours, when the treatment is repeated. After each urination the vulvar compress is renewed. Within twenty-four to forty-eight hours, in successful cases, the urethral, vulvar, and vaginal secretion is free of gonococci.

If the gonococci disappear, the urethral irrigation and bougie are omitted entirely and a vaginal irrigation of bichloride of mercury solution, 1 to 4000, or a solution of $\frac{1}{2}$ per cent. zinc sulphocarbolate, is substituted for the irrigation with protargol, and the vaginal tampon. The warm sitz baths are continued for a few days longer.

Further examinations must be made, and only when the urethral and cervical discharge remains free of gonococci, even after the next following menstruation, is the patient considered cured. Should discharge with gonococci reappear, the treatment is continued until the patient is cured.

There is a certain thoroughness in the plan just given which is commendable, and in a good proportion of cases would, we think, insure its success. It is rare to see cases in the very earliest stage, so that the use of an abortive method, in the strict sense of the word, would very seldom be feasible. Even in late cases, however, such thorough treatment has much to recommend it.

Boldt[1] calls attention to the wide variation which exists in the treatment of gonorrhea. He thinks it is futile to attempt to abort an attack.

In the acute stage, strong solutions are extremely painful, and all remedies so far known, except chloride of zinc, have a superficial action only, and do not reach the deeper layers of epithelial cells. Physiological salt solution or some mild antiseptic in plain water has a decided therapeutic value in washing away the superficial germs, and is not painful.

[1] Journal of the American Medical Association, February 1, 1908, vol. 1, No. 5, p. 330.

When the acute stage is past, protargol, in 10 per cent. solution, is applied to the vaginal mucosa after the secretions have been thoroughly wiped off with absorbent cotton, and a pledget of absorbent cotton soaked in the solution is applied to the vaginal cervix and held in place by an ordinary wool tampon.

Erosions on the cervix are painted with a 5 to 10 per cent. solution of silver nitrate and all distended follicles are slit open.

Urethritis is treated by means of an intra-uterine applicator syringe. This instrument has a long tip. After filling the barrel with solution, the long tip is evenly wrapped with cotton. Application is made shortly after the passage of urine has washed out the gonococci lying on the urethral mucosa. The cotton-wrapped syringe nozzle is then carefully introduced the required distance and the medicament injected into the cotton. This is left in position by holding it while the syringe nozzle is withdrawn. After ten to fifteen minutes the cotton bougie is removed by the patient.

The ducts about the vulva are carefully examined, and, if infected, the secretion is gently expressed and the medicament injected. A cotton pledget saturated with 10 per cent. protargol is placed between the labia, covered with a non-absorbent cotton pad, and held in place by a napkin. The treatment is repeated every second or third day. During the interval the patient is directed to use copious vaginal douches (four quarts) of mild boric acid solution about four times daily.

So long as the disease is limited to a specific urethritis and vulvo-vaginitis, the treatment is comparatively simple, and in most instances it can be confined to these sections of the genital tract if the patient is treated in the early stages of the disease. No internal treatment, beyond restriction in diet, is prescribed.

If the ducts of Bartholin are involved, they must be treated on surgical principles. If a cyst forms, it should be exsected. If an abscess results, it should be opened by a long incision parallel to the inner lip of the labium. The cavity, after being cleansed, may be swabbed with pure phenol, followed immediately by pure alcohol, and then packed with iodoform or other gauze.

When the infection obstinately remains in small ducts, they are split and treated with the actual cautery. Condylomata are removed with a cautery knife, each one being seized with a pair of thumb forceps and cut off; a dry dressing is then applied.

It is most important to prevent reinfection. When the cervix is involved, applications are not limited to the cervical canal, but the uterine mucosa is at once attacked.

The author prefers to put the patient under anesthesia and disinfect the genital tract with the most scrupulous antisepsis. The uterus is copiously irrigated with a double current bladder catheter; then the cervix is dilated thoroughly, but slowly and gently, so that no tears are caused.

The uterus is curetted with a sharp Martin curette, a small size being used around the tubal openings. After abrasion, the uterus is again copiously irrigated with plain sterile water or a mild antiseptic solution and tamponed with a long strip of gauze soaked in 5 per cent. protargol. The rest of the genital tract is tamponed with iodoform gauze and the patient is put to bed.

Urethritis and Bartholinitis, if still present, are treated at the same time.

The intra-uterine gauze is removed the next day and the entire treatment is repeated, excepting the curettement, and again on the third day. The repetition of treatment does not cause much annoyance to the patient if the cervical dilatation has been thorough.

If consent to curettement is not given, an intra-uterine application is made. The barrel of the syringe is wrapped with cotton and inserted into the uterine cavity. The solution is injected into the cotton, which is held in place while the syringe is withdrawn. A string is tied to the lower end of the cotton before the applicator syringe is introduced. A tampon soaked in protargol is then placed in the upper part of the vagina, and is held in position by a plain non-absorbent wool tampon.

The strings of the vaginal tampons are marked so that the patient can tell which to extract first.

At first, the intra-uterine tampons must be made quite thin, but later, the cotton may be increased in thickness because the cervical canal becomes more readily dilated. After removing the tampons, a copious antiseptic douche is taken by the patient. This plan of treatment is associated with more danger than curettement and the procedures previously prescribed, and hence should not be employed if the patient will consent to the operation.

In unusually obstinate cases of corporal gonorrhea Boldt has obtained very good results with a 50 per cent. chloride of zinc solution, applied in the same manner as protargol solution, but using not more than three to five drops, depending on the size of the uterine cavity and the quantity of cotton. If more is used, there is danger that it will come in contact with the cervical canal and cause a subsequent stenosis. The disadvantage of chloride of zinc is that it sometimes causes intense pain. It is advisable, therefore, to let the patient rest in bed for a day or two after its use. Should pain occur, absolute quiet, an ice-bag to the lower abdomen, and the administration of a narcotic are advisable. A further disadvantage of chloride of zinc is that its destructive action may go too deep, destroying almost entirely the endometrium and causing a cessation of menstruation for a few months. In his experience, this result has never been permanent, the longest period of amenorrhea being five months.

The nozzle of the intra-uterine syringe should be four and one-half inches long and slightly curved near the end. It should be absolutely

smooth and even and have but one opening, and that at the end. The connection between it and the syringe barrel must be tight, so that no fluid can escape there while the injection is being made. The medicament comes into direct contact with the parts for which it is intended, because the cotton is soaked first at its very end and becomes gradually saturated from above downward.

As soon as there is any evidence that a gonococcus infection is passing to the tubes, absolute rest in bed and an ice-bag to the abdomen should be prescribed. Peristalsis should be kept at a minimum by the administration of a narcotic. Pelvic examination must be avoided, or performed as gently as possible. When the acute symptoms have subsided, warm vaginal douches containing a mild antiseptic may be started. The douches should be copious and frequent. The cold applications are continued until the temperature is normal and the patient is free from pain. The patient is kept in bed until the temperature has remained normal or nearly normal for at least a week.

After the acuteness of the ailment has subsided, local treatment is started, consisting of tampons large enough to cover the entire vaginal roof, saturated with a 5 to 10 per cent. solution of ichthyol in glycerin, and held in place by a dry wool tampon.

After removing the tampon at the end of twenty-four hours, the patient should use a copious douche, the temperature of the water being as high as the patient can bear without discomfort. Intra-uterine treatment must still be avoided, even if the discharge from the cervical canal is purulent, because of the danger of causing a fresh attack of salpingo-oöphoritis with pelvioperitonitis.

If the patient at any time shows an exacerbation of symptoms, she should at once be returned to bed and the rest treatment be resumed. Once the adnexa have been implicated, intra-uterine therapy should never be used until all evidence of adnexal disease has disappeared, unless it is intended to resort to a thorough surgical intervention.

Most patients will make a good recovery, sometimes with a *restitutio ad integrum*, and subsequently become pregnant.

If the Fallopian tubes become distended with pus and gravitate to the floor of the pelvis, conservative treatment is no longer advisable. It is better to open the cul-de-sac of Douglas, incise, evacuate, and drain the tubes. The uterus at the same time should be thoroughly curetted and packed with a strip of medicated gauze.

In chronic cases, when surgical intervention is indicated, the abdominal route and conservative surgery are indicated. If it is necessary to sacrifice both ovaries, the uterus also should be extirpated.

Treatment of Bartholinitis. Ploss[1] recommends *Bier's treatment* for Bartholinitis. He reports the result of its use in 21 cases, including those complicated by abscess or pseudoabscess formation.

[1] Berl. klin. Woch., April 20, 1908, No. 16, p. 782.

In all, there had been or there was gonorrhea, as determined by finding the gonococcus.

In large abscesses with much inflammatory reaction in the surroundings, incision and packing were used as a preliminary. The smaller abscesses were incised with a small lancet before the cups were applied. The cupping glass was used for about thirty minutes a day, mostly in two sittings of fifteen minutes each. The pain quickly subsided, the secretion became normal, the infiltrate diminished, and the wound healed quickly. The author feels that he can recommend this form of treatment very highly.

Treatment of Vaginitis. Kehrer[1] gives the results of treating vaginitis by means of *yeast*. He prefers a sterile permanent preparation of yeast which contains no living cells. The germicidal action is the same as that of fresh yeast, and the dangers attached to the use of a fresh preparation are avoided. He uses Albert's yeast, 4 grams of it being mixed with 20 c.c. of water and stirred into a pulp.

The vagina is thoroughly washed out with sterile water and then dried. The yeast pulp is injected into the vagina slowly by means of a hard rubber syringe, the patient being in the Trendelenburg position. Two or three gauze strips are placed over the introitus to prevent much outflow of the fluid and to moisten the vulva about the ducts of Bartholin's glands. After six or seven hours the vagina is again washed out and dried.

In 6 cases with acute gonorrheal vaginitis the infection was stopped in from three to seven days' treatment, tenderness, redness, and swelling being permanently allayed.

The author reports also 23 cases of chronic vaginitis in which the early history or a previous examination for the gonococcus had made that origin positive or probable, although it was not found at the time treatment was undertaken. In 16, all inflammatory symptoms had disappeared after four to eight days' treatment and did not return during several weeks of after-observation. In 12 of these cases a purulent endometritis was treated in addition. In 4, the vagina alone was affected.

In 7 of the 23 cases there was either very little or no influence upon the inflammation after eight days' treatment, and a 5 per cent. solution of protargol or a 2 per cent. solution of nitrate of silver acted much better. If no good is obtained by the use of the yeast treatment in four or five days, it might as well be stopped. In acute gonorrheal vaginitis yeast is prophylactic, preventing the spread of the infection upward.

Serum Therapy of Gonorrhea. Taylor[2] says that analogical evidence certainly points to the utility of a serum therapy in many cases of gonococcus infection. The subject is still in an experimental state, being first developed by Moskaleff in 1904 and 1905.

The action of the gonococcus on the various tissues of the body,

[1] Münch. med. Wochensch., February 4, 1908, No. 5, p. 220.

[2] American Journal of Obstetrics, January, 1908, vol. xvii, No. 1, p. 1.

depends upon the activity of the gonotoxin. The latter has a chemotactic action, producing a sterile suppuration or exudate. Serum of rabbits rendered immune by the inoculation of gonococci proved to a certain extent to be curative and preventive.

Bruck's studies show that there is no ground for believing that the ordinary common gonococcus infection of the human subject produces immune bodies. In prolonged and severe, or in acute general gonococcus infections, antibodies may appear in the blood.

If rabbits are immunized by living cultures of gonococci, a serum is obtained which possesses marked agglutinative power, but is weak in antibodies. If an aqueous extract of the gonococcus is used for immunizing, there is no trace of agglutinins, but a high percentage of antibodies.

The experiments of Torrey and Rogers seem to indicate that the most important factor in the good results obtained with gonococcus serum is in its bactericidal action, and they are inclined to believe that there is an antitoxic action also.

Taylor believes a gonococcus serum will be most effectual in the active and nascent conditions of gonorrhea. He believes it impotent and even inert in chronic cases in which the activity of the gonococcus is impaired or destroyed.

The serum treatment seems to have been used especially for gonorrheal vulvovaginitis of children. Hamilton and Cooke[1] concluded that while inoculation treatment produces no marked improvement during the first weeks of acute cases, it seems to shorten the later stage; its effect is more evident in the chronic than in the acute cases.

Butler and Long[2] have used gonococcus vaccine in 25 cases in female children varying in age from one and one-half to twelve years. The opsonic index was studied closely in each individual case. The patient's index was taken every other day, and each dose of vaccine was administered and regulated accordingly.

No local treatment was used in any of the cases. Two stock vaccines were employed, one prepared from a single culture, another from several different cultures. No effort was made to cultivate the gonococcus from individual cases, either to confirm the diagnosis or to make autogenous vaccines. For details and dosage, the writer is referred to the original article.

Twelve acute cases were treated. Nine of them recovered, as judged by complete cessation of the discharge and at least three or four negative smears taken from the vaginal mucosa at intervals of three or four days. The duration of treatment averaged forty-three days. Thirteen chronic

[1] Journal of Infectious Diseases, March, 1908.

[2] Journal of the American Medical Association, October 17, 1908, vol. li, No. 16, p. 1301.

cases were treated, and of these, eleven recovered after a period of treatment averaging three hundred and ninety days.

In summarizing the result of their work, the authors say that in the treatment of gonorrhea in female children, gonococcus vaccine is more effective than local applications, which they think actually delay recovery in some instances. The vaccine treatment is not only effective, but in many cases, particularly those of some standing, produces very rapid improvement, and often recovery. This does not, however, hold good in all chronic cases, nor in all acute cases, many of which require a prolonged course of inoculations. The latter point should be held in mind by those undertaking this work.

The most effective dosage of vaccine varies for different cases and at different times for the same case. This will be best determined by the patient's opsonic index to the gonococcus. The authors have found doses varying from 5,000,000 to 50,000,000 very satisfactory. Where inoculations are practised without the index in the quantities mentioned, they should be given every fifth or sixth day. Doses up to 100,000,000 may be used without causing any general reaction on the part of the patient, except in rare cases. The larger doses do not seem to have been more effective on the immunity wave or clinical condition than smaller ones.

There seems to be no particular advantage in a vaccine made from several strains over that made from a single strain of the gonococcus.

Churchill and Soper[1] also have employed inoculations of gonococcus vaccine for gonococcus infections in children.

Their principal object was to determine whether the disease was shortened. Incidental observations were made on the opsonic index before and after the inoculations. Forty-one patients in all were treated; other therapeutic measures were omitted. They treated continuously but eighteen patients. A patient was considered cured when all discharge had ceased and when four successive smears taken from the vagina failed to show the specific organism.

The tests covered a period of seven to fourteen days. Of four patients seen at various periods after discharge from the hospital, three gave positive smears. These patients had been discharged three weeks, one month, and four and one-half months. The fourth was free of the infection three months after the discharge.

Three patients remaining in the hospital for various reasons are free from gonococci—two and one-half, three, and five and one-half months. Two died in the hospital—twenty-one and twenty-five days respectively after the first of the four negative smears. Thus, of nine patients followed up, six have been found free from evidences of gonococcus infection for periods ranging from three weeks to five and one-half months.

[1] Journal of the American Medical Association, October 17, 1908, vol. li, No. 16, p. 1298.

The opsonic index has been estimated by the usual Wright method. The killed bacteria, prepared and standardized also by the Wright method, have been prepared from old strains of one organism. The dose has been more or less a matter of guesswork; it was started at 15,000,000 and raised to 120,000,000 for the oldest girls, and 60,000,000 or 80,000,000 for those around the age of five years.

The duration of hospital treatment varied from two to eighty-four days. There was no immediate effect on the vaginal discharge from an individual dose. Sometimes a profuse discharge would be lessened within a few days, sometimes increased, and still again no effect was noted.

The opsonic index showed a tendency to run above rather than below normal with the progress of the disease in the cases failing of a cure, and a decided tendency to approach the normal in the cases which were cured.

Swinburne[1] reports the use of the Rogers-Torrey antigonococcic serum in 69 cases of gonorrheal infections. He also has come to rely upon it as a valuable aid in the treatment of these cases.

Additional information on gonococcus vaccines and sera will be found in PROGRESSIVE MEDICINE for December, 1908, page 221.

Conservative Treatment of Inflammatory Conditions of the Adnexa and the Pelvic Cellular Tissue. Horrmann[2] gives the history of the treatment of pelvic inflammatory diseases in more or less detail, and shows how surgeons have gradually turned from a very radical to a more conservative view. In the year 1903 Peham and Keitler reported 126 cases which were treated by absolute rest in bed, the application of heat or cold to the abdomen, hot vaginal douches, sitz baths, and ichthyol tampons; 73 were relieved, and the author came to the conclusion that although there are cases in which operative treatment was demanded, there is no doubt that adnexal inflammatory disease even with pronounced alterations and serious subjective symptoms can be entirely relieved by conservative treatment.

The cases from Amann's clinic, referred to by Nebesky during the same year, led to similar conclusions. Amann has given the subject very careful consideration since 1900, and the frequency of operating for pelvic inflammation has proportionately decreased. At the present time operation is indicated only when the symptoms are acute and life-threatening, when the case is certainly or apparently tuberculous, and when conservative treatment does not restore the diseased organs to a relatively healthy condition.

In the last six and a half years there have been 1600 cases. During five years there were but 7 in 1244 cases (0.56 per cent.) in which conservative measures failed to relieve the symptoms and restore the diseased organs to comparative health.

The measures employed in this conservative treatment include pos-

[1] Medical Record, November 14, 1908, vol. lxxiv, No. 20, p. 825.

[2] Zeitschrift f. Geb. u. Gynäk., Band lxi, S. 87.

terior vaginal incision and drainage, hot and cold compresses, vaginal douches, thiogenol tampons, regulation of the bowels and diet, superheated air, the introduction into the vagina of a colpeurynter filled with mercury ("weighting method"), massage, and intra-uterine electrical treatment.

The weighting method is especially effective in chronic conditions in which there is no elevation of temperature, especially in chronic alterations of the adnexa and adherent retroflexion. It is an easy sort of treatment for the patients, and as they lie quietly and have no pain or psychical sensation it is very much better than pelvic massage. This plan of treatment, furthermore, serves to differentiate between solid and inflammatory tumors.

Runge[1] also recommends the weighting method in the same sort of cases. He uses it every second day for an hour. The first time 20 c.c., the second time 50 c.c., the third time 75 c.c., the fourth time 100 c.c., and the fifth time 120 c.c. of mercury are used, the last quantity corresponding to a weight of 1720 grams.

Runge speaks favorably of the hot-air treatment for pelvic inflammations, and describes a cabinet in which the heat is supplied by incandescent lamps. In this cabinet a heat of 100° C. may be obtained on the surface of the abdomen. If it is desirable to lower the temperature, several of the lights may be shut off. There is no disturbance of the skin if it is covered with several layers of gauze, which absorbs the perspiration. He recommends the procedure in all chronic diseases of the pelvic organs of an inflammatory nature, and says that it gives very good service in the treatment of pain from adhesions.

The method is contra-indicated in all acute febrile processes and in the presence of a failing heart. The treatment should be given for an hour every second day. The patient should rest, wrapped in wool, for from one-half to three-quarters of an hour afterward. The average number of treatments in dispensary practice was ten. Within the last two years 231 patients were treated, and in the great majority of cases with very good results.

Conservative Operations. Peterson[2] reviews 460 cases of *hysterectomy* with removal of the appendages, and 209 cases of hysterectomy in which the ovaries were retained. In the first series 37.8 per cent. had no troublesome symptoms. The author found no difference in the results, whether the operation had been panhysterectomy or supravaginal hysterectomy.

The author concludes as follows: At least 10 per cent. of all women regularly menstruating at the time of operation will be free from the troublesome symptoms of an artificial menopause after hysterectomy even if both ovaries are removed.

[1] Münch. med. Wochensch., January 7, vol. lv, No. 1, p. 22.

[2] American Journal of Obstetrics, May, 1908, vol. lvii, No. 5, p. 633.

The percentage of women with no symptoms after a similar operation will be slightly more than doubled if some ovarian tissue be retained. Even when the symptoms of the artificial menopause occur they are much less severe when the ovaries have been retained.

It is not necessarily true that the younger the woman the more she will suffer with menopausal symptoms after hysterectomy with removal of the ovaries. The most trouble occurs in women between the ages of forty and forty-four. Therefore, the rule that ovaries should be removed with the uterus when the patient is over forty should not be followed.

The frequency and severity of the artificial menopause is not influenced in any way by the type of hysterectomy performed, whether the ovaries have been conserved or not.

The severity of the symptoms of the menopause is practically the same after hysterectomy with removal of the ovaries, whether it be for fibroid tumor or for pelvic inflammatory disease.

Retention of ovarian tissue after hysterectomy abbreviates the period of suffering from the artificial menopause. The greater the amount of ovarian tissue conserved, the more will the symptoms be mitigated.

Estimation of Leukocytes as an Aid in the Diagnosis and Prognosis of Pelvic and Abdominal Inflammatory Diseases. Albrecht[1] studied 164 cases from which to draw conclusions in regard to leukocytosis. The examinations were made for both the absolute number of leukocytes and for the varying proportions of each kind (differential count).

As a result of his observations, which are given in great detail, and to which the reader is referred, he concludes as follows: In acute pelvic peritonitis there is a diagnostic aid in the leukocyte count. It will be of help in estimating the severity of the particular infection, and in cases of long duration subsequent counts will show a dissemination of the infection on the one hand or an abscess formation on the other.

In the case of pelvic inflammatory tumors (pyosalpinx, parametritis, exudative perimetritis) a leukocytosis of over 15,000, especially if the condition has existed for some time, may be taken as an indication of pus.

After an abscess is opened, a continuing and eventually increasing leukocytosis may be indicative of the retention of pus. To a certain extent, the leukocyte count is useful in the differential diagnosis between the inflammatory and the non-inflammatory adnexal tumors.

In mild cases of puerperal fever there is a relatively low leukocytosis which usually declines with the clinical symptoms after the local infection has been eradicated. In severe cases of puerperal sepsis and pyemia which end in death there is sometimes a correspondingly low absolute number of leukocytes, and this may be taken as a bad prognostic sign. In several cases, however, there was an extraordinarily high leukocytosis which lasted to the end.

[1] Zeitschrift f. Geb. u. Gynäk., 1907, 1908, vol. lxi, S. 8.

In parametritis and exudative perimetritis during the puerperium, there is leukocytosis, as a rule, which corresponds well to the formation of pus; after evacuation of the pus it disappeares. In some cases ending in general pyemic infection the leukocytosis continues.

Leukocytosis occurs in cases of abortion associated with infection, and corresponds to the severity of the infection and its course.

In tuberculosis of the peritoneum there is no outspoken leukocytosis.

A qualitative estimation of the leukocytes may confirm the quantitative estimation, and in certain cases may be of prognostic importance. Thus, the percentage of polynuclears indicates the gravity of an infection. A particularly high percentage is found in severe infections, but is not an unfavorable sign if the absolute number of polynuclears is correspondingly increased. A diminution in eosinophiles and mast cells is indicative of a serious infection.

A diminution in the absolute number of polynuclears, with a coincident lessening of their percentage, shows the subsidence of an infection; a sudden diminution of the absolute number, with a disproportionate small decline or eventual increase of their percentage, is a bad prognostic sign, for it shows that the emigration of polynuclear cells can no longer keep up with their consumption because the blood-forming organs are exhausted or for other reasons.

An absolutely unfavorable sign is a sudden diminution in the absolute number of lymphocytes. When this is much below normal, it indicates a particularly severe infection.

The onset of healing is usually manifested by a relatively large increase in the absolute number of mononuclears and eosinophiles, often rising above the normal. Douglas[1] after reviewing the work of others upon the subject, states that he has made careful total and differential counts in 50 cases of acute abdominal inflammation. The average leukocytosis in the acute pelvic cases was 25,100; in general and spreading peritonitis, 17,800; in gangrenous appendicitis, 21,950, and in acute appendicitis subsiding without operation, 12,800.

The relation between the total and the differential count, which was suggested as of greater value than either taken alone for determining the diagnosis and prognosis, showed greater variation and was less dependable than the differential count alone. A differential count is perhaps of greater value than a total count, as it shows somewhat less variation; but it also exhibits a considerable margin of error.

Noehren[2] as the result of his own and the work of others, believes that the differential count is of great value in determining the severity of acute appendicitis and, therefore, in deciding whether or not immediate operative interference is indicated.

[1] New York Medical Journal, September 26, vol. lxxxviii, No. 13, p. 590.

[2] Annals of Surgery, February, 1908, vol. xlvii, No. 2, p. 239.

The degree of leukocytosis, formerly considered an important diagnostic aid, is too variable to be of any practical value.

The relative proportion between the percentage of polynuclears and the degree of leukocytosis is reliable in a majority of cases, but the number of exceptions is so great that its practical value in determining immediate operation becomes very small.

The estimation of the percentage of polynuclears alone is more reliable than either of the preceding methods, and, therefore, together with the fact that it is the one most easily made, it is the method to be recommended.

A polynuclear percentage of 90 per cent. or more indicates a severe process that needs immediate operative interference; a percentage below 78 means a "safe" or mild process; a percentage between the two extremes speaks for a graver or milder process according as it approaches the one extreme or the other.

Fowler[1] says that leukocyte counts in acute surgical diseases may prove dangerous and unreliable when divorced from clinical symptoms, but when taken in conjunction with the history and physical signs may be of inestimable value and of preponderating worth in diagnosis.

The author has studied 278 cases with regard to the numerical and the differential estimation. From a study of the numerical counts, he would say: The absence of leukocytosis in a case in which from the severity of the symptoms an increase in the leukocytes would naturally be expected is a serious indication and justifies an unfavorable prognosis; on the other hand, in an evidently favorable case it means a mild lesion.

No increase or a moderately low count means either a mild infection resulting in scarcely appreciable alterations, or an infection so severe that the economy is powerless to react, or, in cases of some duration, the encapsulation of pus and a cessation of absorption.

Hence, there is great necessity to weigh the clinical signs and symptoms in conjunction with the numerical estimation of leukocytes.

The polynuclear neutrophile leukocytes (including transitional forms) were chiefly concerned in the investigation of differential counts. He considered 75 per cent. the extreme limit occurring in health. The author concludes:

That a polynucleosis in the presence of appendicular lesions does not necessarily mean pus, gangrene, or even a severe inflammatory lesion. He found it as high as 90 per cent. in seven cases of simple, acutely inflamed appendices, independent of pus or gangrene, the highest of these being 94 per cent.

Pus may be so well encapsulated (7 cases) as not to be sufficient stimulus to cause polynuclear increase.

Spreading peritonitis and the early stages of a diffuse infection usually show a high polynucleosis. Later, it may be low; the lower,

[1] Surgery, Gynecology, and Obstetrics, September, 1908, vol. vii, No. 3, p. 308.

the worse the prognosis. When low, the outlook is extremely unfavorable, as it indicates that one of the last barriers of defence has been broken down. Of 3 cases below 80 per cent., 2 died, one with 77 per cent., another with 78 per cent.; the third, with 73½ per cent., recovered, being a very exceptional case. The differential counts per se in such cases are valueless in reflecting the character of the lesion, but of aid from a prognostic point of view when the duration of the disease is taken into consideration.

A high polynucleosis in the face of severe lesions is a good omen and to be expected and its absence gives cause for alarm. A favorable termination has been observed when the polynuclears were as high as 97 per cent.

An increasing polynuclear count is indicative of extension or increased absorption from an existing focus. It should not lead to delay in operative interference. It may be the only sign of an extending infection or increasing absorption, or both, and it may be independent of an increase in rigidity and pulse rate, etc.

A decreasing polynuclear count, on the other hand, may have the same significance as the subsidence of a numerical leukocytosis, namely, a regression of inflammation or an arrest of the vital forces at hand to combat the process. The facies and general condition of the patient will indicate the true state of affairs.

Genital Tuberculosis in Women. Baisch[1] gives the results of the surgical treatment of genital and peritoneal tuberculosis, basing his report on 110 cases at Döderlein's clinic. He shows that a period of four years is usually required to determine a cure. Forty of the cases died either primarily or during the first four years, a total mortality of 30 per cent. After four years from the time of treatment there were no deaths. Surgical aid would appear to offer more hope than internal treatment, 33 per cent. being the average proportion of cures when internal treatment alone is employed, as shown by the statistics of Rose from Naunyn's clinic.

Thirty-eight of his cases had peritoneal tuberculosis with ascites. More than half occurred in patients between the ages of fifteen and twenty-five. In 20 menstruation was entirely normal; in 8 the flow was somewhat too free; in 6 puberty was delayed, menstruation appeared late, or after early regular periods amenorrhea ensued.

Of the married women, all but three had borne children, but only one patient was delivered of a child afterward, and in this case the treatment was expectant and the diagnosis was not absolutely certain. It seems evident from the author's observations that peritoneal tuberculosis almost invariably destroys fertility. Thirty-four of the 38 patients were treated by laparotomy or posterior colpotomy; 12 died. In 17 out of 24 cured

[1] Archiv f. Gynäk., 1907–1908, Band lxxxiv, S. 345.

cases there was no palpable alteration in the abdomen or the pelvis, there was no pain, and the patient was fully able to work.

The best results were found in the cases in which there had been no fever and no other serious tuberculous lesion, the patient being in such strength that the operative procedure did not seriously weaken the organism. In 11 cases a T-shaped rubber drainage tube was placed through a posterior vaginal incision.

There were 22 cases of dry adhesive tuberculosis of the peritoneum; 15 of these were between the ages of fifteen and twenty-five years. In 2 patients menstruation had not begun; in 4 the menopause had occurred; the menses were fully normal in 6; in 1 the flow was very slight; in 7 menstruation had begun late; in 3 it had begun late, but there was a profuse flow. One patient complained of irregularity of the flow and profuse discharge; in 3 the periods had been absent for from five to seven months; in 2 it had been much more profuse since the beginning of the trouble.

Among 14 married patients there were 63 children before the onset of the disease. None of those who recovered from the trouble became pregnant subsequently. Of the 22 patients, 11 were treated expectantly, with 8 deaths; 11 were operated on, with 2 deaths; of the 8 cures, 5 have been observed for five years or longer. The operation consisted of an exploratory incision and closure. No attempt was made to separate intestinal adhesions. Such an attempt does not do the patient any good, and predisposes to fecal fistula.

There were 45 cases of *tuberculous disease of the tubes*—20 patients between fifteen and twenty-five years, 18 between twenty-six and thirty-five years, 5 between thirty-six and forty-five years, and 2 others, aged fifty and sixty-three years respectively. In only 14 patients was menstruation entirely regular; in 11 it was increased; and 3 suffered from marked metrorrhagia. Puberty appeared late after the sixteenth year in 22 of the patients. Two patients were at the menopause. In 6 patients the previously regular periods had disappeared for from nine months to a year. Only one of the married patients was sterile. After the disease, however, no patient gave birth to children. Thirteen of the cases were treated without operation; 32 were operated on.

Of those expectantly treated, 8 died. Half of these were so advanced that no operation would do any good; in the remainder there was pulmonary or pleural tuberculosis. Of the 5 patients who were benefited, only one is subjectively and objectively cured. Four express themselves as having been very much benefited, but still have adnexal masses on both sides of the uterus.

Of the 32 patients which were operated on, 9 died—4 at the time of the operation, 5 from three months to two and one-half years afterward. In 13 of the living the result is fully satisfactory, both objectively and subjectively. There are 4 other patients who objectively appear much

benefited, but still complain of symptoms. In 6 the subjective symptoms are much improved, in so far that there is no more pain, and they are fully capable of work, but new inflammatory masses have developed. The number of cases of incomplete cure, either subjectively or objectively, show plainly the relatively small tendency to a spontaneous cure of tuberculosis of the tube.

From his experience Baisch recommends the removal of both tubes, even when one appears entirely healthy. Another question is whether one should always remove the uterus and ovaries. According to Hegar, Sellheim, and Veit, as radical an operation as possible should be done. In the author's experience, however, none of the patients in whom the uterus was left, had any recurrence. The tubes, however, were always excised from the uterus by means of a wedge-shaped incision.

The question of removing both ovaries is somewhat different, since it has been shown that tuberculosis of the ovary is not so very infrequent. The question arises mostly in young women in whom the removal of both ovaries may be followed by the most severe climacteric symptoms. The author is inclined to recommend the conservation of at least one ovary in patients under thirty years of age.

An abdominal operation is, as a rule, preferable to the vaginal. In exceptional cases, where there are no dense adhesions, colpotomy may be satisfactory.

In but few of the authors' cases were all of the therapeutic measures in vogue today for the treatment of tuberculosis employed. For most patients such treatment is too expensive and too tedious, and quite impossible to carry out, the well-directed sanatoria for tuberculosis being filled mostly with patients who have phthisis. For other forms of tuberculosis there is not much provision.

McGlinn,[1] noting the various reasons which have been given for the cure of a tuberculous peritonitis following abdominal section, was led to try the use of oxygen, and so far has employed it in 15 cases; of these, 4 belonged to the fibrous variety. At the present communication he reports only the 4 fibrous, reserving the ascitic cases for a later report. He gives his technique as follows: The water bottle of the oxygen apparatus is sterilized and filled with sterile water. The tube leading from the bottle and the rubber tip are sterilized. The tip is covered with several thicknesses of sterile gauze. The oxygen is introduced through the abdominal incision until the abdomen becomes inflated. The incision is now closed with gauze and the oxygen is allowed to remain for several minutes. The gas is then allowed to escape, and the peritoneal cavity is filled again and again.

The duration of the oxygen treatment in the cases reported vary between twenty and thirty minutes. All of the cases have been cured or very much benefited.

[1] New York Medical Journal, August 22, 1908, vol. lxxxviii, No. 8, p. 359.

Pruritus Ani. Mason[1] believes pruritus ani always has some well-defined cause, which if searched for and removed in the early stages will effect a cure. Later, however, the terminal nerve filaments become affected, and even though the original cause no longer obtains, the itching continues. The skin becomes thickened and the nerve endings are pressed open and constantly irritated. In such cases nothing will give permanent relief except the destruction of this altered tissue and the formation of new skin.

The disease is due in the majority of instances to an unnatural discharge of moisture, which may be brought about in various ways. The cause may be internal or external hemorrhoids, chronic proctitis, ulceration, fistulas (especially the small submucous variety, with no external opening), pin-worms, dry, hard fecal masses, the lodgement of irritating matter in the so-called rectal pockets, or the growth of small polyps.

In over 90 per cent. of the cases, as pointed out by Wallis, the lesion is a small shallow ulcer usually situated between the two sphincters, in the posterior dorsal midline.

Wallis says that the ulcer is not easy to recognize by touch, a certain amount of practice being required to appreciate its presence. It is just within the anal margin, and always below the internal sphincter. The smooth feeling of the healthy lining membrane disappears when the finger comes into contact with the ulcer, and a slightly raised margin can be felt around it. The ulcer is not sensitive, as a rule. If the region is exposed with a bivalve speculum, slightly opened, in a good light, the ulcer can be clearly seen as a "shallow, oval, livid abrasion, differing markedly, and mainly in color, from the normal mucous membrane."

If the skin of the anus has become thickened and rough, in order to effect a cure, some method must be adopted to restore the skin to its normal condition. This may be attempted by the application of a 95 per cent. solution of carbolic acid or a saturated solution of silver nitrate. The epidermis peels off in a few days, leaving a somewhat tender surface that should be treated with soothing ointments, like zinc oxide. The application may be repeated at intervals of two or three weeks. In obstinate cases the skin may be removed by excision with the knife or destroyed by passing the white hot cautery over it.

The lower bowel is treated by irrigation with solutions of boric acid and the injection of a 25 per cent. mixture of the glycerite of hydrastis. Other antiseptic astringent solutions, such as are beneficial in catarrhal conditions of other parts of the body, may be used.

Citrine ointment is the most effectual application of which the author knows, both to relieve the patient and to favor a permanent cure. After bathing the parts in very hot water the ointment is applied freely on gauze and bound on with considerable pressure.

[1] New York Medical Journal, June 13, 1908, vol. lxxxvii, No. 1, p. 1150.

The general condition of the patient should be carefully examined especially for evidences of diabetes, rheumatism, gout, and uricemia. Coffee and alcohol seem to aggravate the disease in certain persons.

Owing to the difficulty of cure in some cases, the author was led to try the effect of the *x*-rays. Although he has not treated many patients, in some it has been so satisfactory that he and his patients have been delighted with the result. He uses it only in old chronic cases when the skin is eczematous and thickened. Just how, he does not know, but the eczema disappears and the skin returns to its normal condition, or nearly so. The technique is as follows: With a soft tube, an exposure of ten minutes' duration twice a week is made until he learns how the skin is going to stand it. If there is no irritation, he gives three treatments a week until a brown discoloration appears. All treatment is then stopped until this goes away, when treatment is resumed until it reappears. Two courses usually suffice, but, if possible, it is well to give an occasional treatment afterward as a matter of precaution. It is too soon to say positively how permanent the results will be, but Mason thinks that there will be no return if the bowel above is put in a healthy condition.

Postoperative Treatment after Abdominal and Pelvic Operations. Grandin[1] makes the following observations on postoperative treatment:

Nausea and Vomiting. He gives his patients all the water they desire. If they vomit, he gives them more, and so washes out the stomach. He regards vomiting as one of Nature's means for getting rid of an excess of ether. If vomiting continues beyond twenty-four hours, gastric lavage is indicated. After the stomach is settled, broth or kumiss is given. Milk being the chief cause of intestinal fermentation and tympanites is not permitted.

Shock. Morphine is used in full dose hypodermically to differentiate nervous shock from that due to hemorrhage. The only other use of opium is in the form of codeine, 2 gr. by suppository, repeated every five or six hours for pain.

Kidneys. Suppression or insufficiency of the urinary excretion is best treated by continuous irrigation of the bowel with hot salt solution. The subject is placed upon the side, a Kemp tube is inserted into the rectum, and from a gravity syringe the salt solution is allowed to run in and out for an hour. This is repeated every two hours without disturbing the subject in the slightest. The salt irrigation, is, moreover, a valuable means of meeting shock, and even renders unnecessary the use of strychnine and other stimulants. For a weak pulse, alcohol, ether, whiskey, or, if the kidneys are insufficient, a good gin is used. Caffeine hypodermically or digitalis or sparteine are used if the heart flags. Nitroglycerin is employed irrationally by many surgeons; it should be given only when there is high tension and repeated (gr. $\frac{1}{50}$) every hour until the

[1] American Journal of Obstetrics, June, 1908, vol. lvii, No. 6, p. 815

desired effect is obtained. When the pulse is full and bounding venesection may be employed. The use of strychnine is somewhat abused: when given at all, $\frac{1}{20}$ of a grain is exhibited hypodermically every three hours, and a close watch kept for toxic symptoms.

Intestinal Tract. The patient is not bothered for thirty-six hours after the operation. At that time a simple high enema or a glycerin enema, two ounces to the pint, will stimulate peristalsis. On the evening of the third day, the stomach being tolerant, 1 to 2 drams of compound licorice powder are serviceable. If at this time the stomach is still irritable, an excellent enema is one-half ounce of inspissated ox-gall and 2 ounces of glycerin, added to one pint of saturated solution of salt given high. In obstinate or torpid intestines, ileus having been excluded, a pint of ordinary coal oil, thrown high, frequently acts like magic. Tympanites, which is considered spastic, is met with hyoscine, one-fiftieth of a grain of the hydrobromate, repeated hourly until the pupils are large. As a rule, unless there be ileus, the spasm relaxes and the subject expels the gas. The use of this drug is far more rational than the pouring of salts or cascara into an irritable stomach, or tiring the subject by repeated enemas.

Posture. Whenever the character of the pulse does not contra-indicate, it is an advantage to have the subject turn from side to side and thus prevent hypostatic congestion of the lungs. After twenty-four hours, if the pulse does not contra-indicate, the patient is allowed to assume any desired position short of getting out of bed. Protracted rest in bed is necessary in exhausted patients. Others are allowed to get out of bed on or about the sixteenth day.

Emergency Operations. If possible, a large dose of calomel and soda is given two hours before an emergency operation; this gives a feeling of security to the surgeon when about the third day gastric irritability or rectal intolerance prevents the administration of drugs or enemas. He has gotten in ahead, so to speak. Whenever pus is suspected, or much handling of the intestines will be required, eserine or hyoscine is repeated hypodermically at intervals of two or three hours. In this way tympanites is avoided and spontaneous evacuation of the bowels is secured within thirty-six hours.

Postoperative Thrombosis and Embolism. Zurhelle,[1] after considering the pathological anatomy of thrombosis and embolism, takes up their predisposing factors, symptoms and prophylaxis, when associated with gynecological operations.

He has seen 35 cases, occurring in patients between the ages of thirty-five and forty-five years. The lesions appeared from the ninth to the sixteenth postoperative day, and most frequently after operations for myoma. In 372 abdominal operations for myoma, thrombosis occurred

[1] Archiv f. Gynäk., 1907–1908, Band lxxxiv, S. 443.

in 3.75 per cent. In 154 vaginal operations it occurred in 2.6 per cent. In 57 abdominal operations for cancer, thrombosis occurred in 3.5 per cent. In 714 operations upon the adnexa, in 0.7 per cent. In hundreds of other operations, such as the Alexander, ventrosuspension, and in plastic work the rate was lower.

The author believes that the special frequency of thrombosis after myoma operations is partly explained by the cardiac and vascular alterations so often found in these cases. In the prophylaxis of postoperative thrombosis, everything should be done directly and indirectly to maintain the action of the heart.

The elevated posture is preferable to the horizontal. The patient should take ten to twenty deep breaths every half hour by the clock. The bowels should be opened soon after operation, and a considerable amount of liquids should be exhibited either subcutaneously or through enemas.

If the patient is anemic and the heart is weak, the foot of the bed should be elevated. Massage and gymnastic movements of the legs are recommended. Döderlein and Krönig massage the entire legs from the feet to the thighs five times a day.

Cohn[1] allowed 100 patients to get up during the first week subsequent to an abdominal operation: 13 on the first day, 16 on the second day, 21 on the third day, 30 on the fourth day, 10 on the fifth day, 8 on the sixth day, 2 on the seventh day. Thrombosis occurred in 3 cases, being attributed by the author to the pre-operative condition.

Sippel[2] believes the keynote to success in the prevention of postoperative embolism is in keeping the patient in the Trendelenburg position for a couple of days. After that time the position can gradually be changed to the horizontal. The Trendelenburg position keeps the blood from accumulating in the pelvis, and has the same advantage as allowing the patient to get up early.

Bloodletting and Venesection in Gynecology. Theilhaber,[3] after drawing attention to the estimate which is placed upon the value of certain operations at the present day as compared with years ago, mentions castration for neuroses, Schröder's amputation of the cervix for the same purpose, fixation of the kidney, and suspension of the uterus.

The author has had frequent occasion to examine women who had been operated upon by other gynecologists for retroposition. The majority of patients told him that at the time of their discharge from the hospital they had felt much improved, but that after some months or a year the symptoms had partly or entirely returned. The primary im-

[1] Zentralblatt f. Gynäk., September 19, vol xxxii, No. 38; Journal of the American Medical Association, vol. li, No. 18, p. 1561.

[2] Zentralblatt f. Gynäk., April 11, vol. xxxii, No. 15; Journal of the American Medical Association, vol. l, No. 20, p. 1662.

[3] Münch. med. Wochenschrift, March 3, 1908, No. 9, S. 439.

provement is due to three factors: The psychical influence, the benefit of rest in the hospital, and the loss of blood in connection with the operation. In the course of years he has come to regard the last of these factors as the most important.

He was impressed by a case of prolapse in which a pessary had given no relief, but in which an operation was successful, and believes that the result was due to the loss of blood in connection with the operative correction of the trouble. He also noted the improvement in the general condition of patients suffering with hemorrhoids after hemorrhage had occurred.

These things gave him the idea that the removal of a large quantity of blood would influence metabolism even better, perhaps, than the induction of profuse perspiration or than the manipulations which are usually carried out in hydrotherapeutic treatment.

He first practically applied this idea by frequently repeated scarification of the cervix in nervous patients in whom he had performed plastic operations, without much relief. In other patients of the same type he has recently encouraged bleeding during the operation, and the neurosis has been more rapidly benefited.

When operative treatment is not indicated, in neurotic patients he employs venesection, withdrawing at first about 100 c.c. (3 oz.), and later, 150 c.c. (5 oz.) to 200 c.c. (7 oz.) of blood. Most of these patients complain of various kinds of pain in the lower abdomen, or in the small of the back, and exhibit no organic abnormality which can be recognized, a retroflexed uterus or a somewhat enlarged but otherwise healthy organ not being regarded as diseased. In the majority of such cases venesection gives good results.

To have a better idea of the effect of venesection, he himself underwent the procedure twice within a period of fourteen days: at one time 120 c.c. (4 oz.) and at another 200 c.c. (7 oz.) of blood were withdrawn. He experienced not the slightest weakness, but felt much better. He slept deeper and longer, his appetite was better, and he felt as if he had had a sojourn in the mountains or at the seashore. He has treated 42 patients with scarification of the cervix, making eight to ten scarifications within a month, so that the loss of blood in these patients averaged 200 to 300 c.c. There were also 41 patients in whom he performed venesection.

He draws attention to the disuse into which venesection has fallen, and believes that it is a very valuable means of treatment in certain nervous pains in the lower abdomen and back, headache, climacteric symptoms, dysmenorrhea, nervous menorrhagia, and metrorrhagia, etc. His oldest patient was aged sixty-six years.

It is requisite to use these measures with antiseptic precautions, and in such a way as to avoid traumatic aneurysm. As a rule, from 1 to $1\frac{1}{2}$ per cent. of the body weight in blood may be withdrawn, and he reports

observations on the blood pressure and clinical examinations of the blood after the procedure. Actual anemia is a contra-indication to it, but in some pale patients with poor peripheral circulation venesection has seemed to do good.

The value of this plan of treatment is seen in cases of nervous metrorrhagia or uterine hemorrhage from atonic metritis, excessive sexual excitement, and preclimacteric hemorrhage. Patients with high blood pressure are more suitable subjects than those with low blood pressure. Venesection seemed to be more useful in purely neurotic patients, and scarifications in uterine disorders associated with neurosis. The method seemed to be especially useful in people with inherited gout or rheumatic taint.

DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE SPLEEN, THYROID GLAND, AND LYMPHATIC SYSTEM.

By ALFRED STENGEL, M.D.

THE BLOOD.

Pernicious Anemia. Etiology. There have been no marked advances during the past year in our knowledge of pernicious anemia or of its treatment. The tendency continues to remove from the group of pernicious anemia those cases in which a definite etiological factor can be determined, leaving only those cases of so-called idiopathic or essential anemia which sooner or later progress to a fatal issue. The term "pernicious anemia" is objected to by some as not giving a very satisfactory idea of what is meant, but as yet no more comprehensive designation has been proposed. Bloch[1] suggests the term "Biermer's progressive anemia," as giving a better idea of the condition under discussion.

So determined has been the desire to place in the group of secondary anemias those cases in which definite causes have been found that by some all cases of anemia are looked on as secondary. Pappenheim[2] says that all anemias, including the so-called essential anemias, are secondary to some destructive or toxic condition. He does not see any ground for regarding the primary or idiopathic form an inexplicable primary deficiency of the bone marrow.

Every anemia depends on a relative insufficiency of the blood-producing apparatus of the body as compared with the blood-destructive processes. Mere blood destruction, so long as it is met with an equal blood production, does not constitute anemia, the latter only resulting when the output fails to keep up with the demand. This disparity results either from insufficient production to meet the normal demand or from excessive blood destruction with an apparently normal production. In the first case the deficiency may be caused by a degeneration of the bone marrow, of infectious, neoplastic, or leukemic origin, destroying or depressing its normal function. In the second instance the blood destruction creates a demand which stimulates the bone marrow to increased but insufficient

[1] Medizin. Klinik, January 26, 1908. [2] Folia Hematologica, June, 1908.

activity. There follows, also, after a time a secondary disturbance of the erythroblastic tissues, resulting in a still further decreased and imperfect cell production.

The destruction of the blood may be due to actual increased loss over the normal, or it may be due to the hemolytic action of a toxin. The former produces the so-called traumatic anemias, the latter gives rise to the toxic anemias.

A special variety of the toxic anemias is produced if the toxin has not only a hemolytic action on the corpuscles but also a primary toxic action on the medullary tissues. The regenerative function of the bone marrow is thus primarily altered and the cells produced are fewer in number, less mature, and aberrant in type. There is, in a word, a reversion to the embryonal method of cell production; and the spleen, liver, and perivascular connective tissues act as vicarious hematopoietic organs. In this case, then, the increased blood destruction due to the toxin and the indirect stimulation of the bone marrow secondary to it act together with the primary direct intoxication of the bone marrow to produce the anemia.

These severe anemias are due in some cases to demonstrable causes, in others to causes of cryptogenic origin. As an illustration of the first we have the anemias due to certain of the intestinal parasites (bothriocephalus latus and ankylostoma duodenale, in both of which definite hemolytic substances have been found). As illustrative of the second we have the so-called essential anemias, in which so far we have been unable to isolate the causes. But in both types there is a primary toxic action on the bone marrow, so that they cannot be looked on as cases of primary anemia in the sense of a primary and idiopathic functional aberration of the bone marrow. They are rather secondary anemias due to toxins of known or unknown origin.

If the disturbance of the bone marrow be further increased by exhaustion or the action of toxin, its regenerative power becomes dormant, unresponsive to stimuli, and incapable of reaction. This is the case in the aplastic type of anemia. But here we have to deal again not with a primary type, but one secondary to the preceding damage to blood and marrow brought about by other causes.

Some of the pathological conditions previously put forward as causes for pernicious anemia may therefore probably act in producing the disease through the agency of toxins or other factors which not only destroy the blood cells but also act directly on the bone marrow.

Reicher[1] includes under the clinical term "pernicious anemia" all those anemias having the classical symptom complex, irrespective of whether they are due to parasites, carcinoma, or the so-called cryptogenetic causes. From the bothriocephalus latus, ankylostoma duodenale, from cancer masses, from organs, and even from normal gastric

[1] Berliner klin. Wochen., 1908, Nos. 41 and 42.

and intestinal mucous membrane there has been obtained a hemolysin which is thermostabile, soluble in ether and alcohol, and resembles a toxic lipoid. This has been looked on as the single cause of all forms of the so-called pernicious anemias. This idea is supported by the fact that in about 96 per cent. of all cases of pernicious anemia there is an atrophy of the gastric mucous membrane. This hemolysin acts in experiments on animals the same way as the lipoid substance found in parasites by Tallquist.

Authorities have differed on the question as to whether gastro-intestinal disturbances have a direct etiological bearing on pernicious anemia. The frequent association of these two conditions suggest some definite relation. Steele[1] says it is often very difficult, if not impossible, to differentiate pernicious anemia from the severe secondary anemias following pathological changes in the gastro-intestinal tract, such as gastric cancer, atrophy of the gastric and intestinal mucous membrane, parasites, intestinal putrefaction due to various organisms, lowered gastric secretion, and mouth infection. The fact that in some individuals certain of these lesions are associated with severe anemia suggests some definite etiological relation between the two; while the fact that similar conditions in others are not followed by anemia seems to depend on the absence of certain factors not yet clearly understood. He suggests with others that the difference in these cases are best explained by the theory of "individual predisposition." Grawitz[2] has during the past year reaffirmed his idea of intestinal intoxication as an etiological factor in the majority of cases. Ziegler,[3] however, states that in many cases the gastro-intestinal symptoms are merely the results of the anemia.

Paszkiewiaz[4] states that while there is an atrophy of the gastric mucous membrane in many cases of pernicious anemia, it cannot be looked on as the direct cause of the disease. Changes are not to be found in the stomach alone, but may be noted in the heart, the liver, the kidneys, the bone marrow, and in the nervous system. He has made a special study of the kidneys in this disease, and comes to the following conclusions: In pernicious anemia there is a fatty infiltration of the kidney of slight degree, and the deposition of an iron-containing pigment; this is true as well of rapidly advancing cases as of those of more chronic course. The pigment is found especially in the cortex in the convoluted tubules and occurs in small masses. In some cases there is an increase and a thickening of the interstitial tissue, especially marked in the medulla, which is to be looked on as a sclerosis.

Labbé and Jottrain[5] call attention to the frequent association of renal lesions and pernicious anemia. They attribute no definite etiological

[1] Pennsylvania Medical Journal, June, 1908.

[2] Medizin. Klinik, October 18, 1908.

[3] Ibid., May 10, 1908.

[4] Virchow's Archiv, vol. excii, p. 324.

[5] Arch. des Maladies du Coeur, June 1, 1908.

relation between the two, but think that both may be the result of some infection or intoxication.

Gunn,[1] in some research work on the action of arsenic on the red cells, is led to believe that the defect in pernicious anemia is in the stroma of the red corpuscles. This is made up largely of lecithin and cholesterin and a deficiency of these substances in the body would permit the easy destruction of the cells. That the hemoglobin is not at fault is suggested by the high individual hemoglobin content of the cells and the observation that iron is found in the liver and other organs and that it is useless as a remedy.

Talley[2] attempts to show the relation of secondary anemia to the pernicious form. He reports two cases of hepatic cirrhosis in which the blood picture changed from that of a secondary anemia to one of the pernicious type. He believes that hemolysis alone can count for secondary anemia, while a deficient hematogenesis is necessary to produce the change to the primary form.

Harshberger[3] reports a case in which an anemia of the pernicious type seemed to have originated in worry and vomiting of nervous origin.

Von Jaksch[4] states that the similarity of pernicious anemia to kala azar suggests a protozoön infection.

Bierring[5] points out the analogy between pernicious anemia and leukemia in that both are evidently of toxic origin and associated with changes in the bone marrow, and that both are liable to remissions of improvement. He refers to Herter's work, attributing etiological significance to specific fermentations in the intestinal tract, especially as caused by the Bacillus aërogenes capsulatus.

Schatiloff[6] emphasizes the absence of hyperplasia of the lymphatic tissues in pernicious anemia. He reports in great detail the histological changes in the blood-producing organs in four cases of this disease. The follicles of the spleen were usually decreased, and those in the lymph glands and in the bone marrow were always so. It, therefore, is quite improbable that cases of pernicious anemia ever change to cases of lymphatic leukemia. Such changes are occasionally reported, but must be explained in some other way. The author suggests that they may be lymphatic leukemias from the start, but with an aleukemic stage.

Symptoms. Taylor[7] reports the symptoms and blood findings in ten cases of pernicious anemia. All of his cases complained of loss of strength, palpitation, dyspnea on exertion, and five also of pain in the abdomen. In appearance they were well nourished, and only two

[1] British Medical Journal, July 18, 1908.
[2] Journal of the American Medical Association, October 3, 1908.
[3] Pennsylvania Medical Journal, June, 1908.
[4] Medizin. Klinik, October 18, 1908.
[5] Journal of the American Medical Association, August 1, 1908.
[6] Münch. med. Woch., June 2, 1908.
[7] Practitioner, August, 1908.

showed the typical lemon-yellow tint of the skin. Edema was present in every case and was especially noted in the lower extremities and under the eyes; the skin, however, was usually dry and harsh. In three cases there was tenderness on pressure over the tibiæ. Hemorrhages occurred in half of the cases; in two in the form of petechiæ, in one from the bowels, in one from the stomach, and in one from the mucous membrane of the mouth. In all the cases there was a hemic pulmonary bruit; in six there was in addition a systolic murmur at the apex.

The digestive system was involved in every case; all complained of loss of appetite; in five there was occasional pain in the epigastrium, not very severe and without apparent relation to the taking of food; in seven vomiting occurred in attacks lasting a day or two, unresponsive to treatment and usually associated with epigastric pain. Diarrhea occurred in every case but one. In only one case was there slight splenic enlargement. Nervous symptoms were not prominent.

With such variation of symptoms referable to either the gastro-intestinal apparatus, the cardiovascular or the nervous system, the final diagnosis rested on the examination of the blood. The percentage of the hemoglobin was diminished, the average in his ten cases being 42.4 per cent., the highest 63 per cent., and the lowest 20 per cent. This reduction was accompanied by a more marked reduction in the number of red corpuscles, the lowest in his series being 600,000 and the highest 3,000,000. The color index was one, or above one, being higher in the extreme cases with marked reduction in the number of corpuscles. The size of the red cell was generally increased, in some instances up to 11 to 13, or even 16 microns. Ewing says that at least 33 per cent. of the red cells should be above the normal size in this disease. Polychromatophilia and granular degeneration were present in the red cells. Normoblasts were present, and megaloblasts occurred almost constantly, though not in great numbers, the highest of the latter being 28, seen while counting 500 leukocytes.

The white cells were reduced in number, the average being 3200; the lowest 1580, and the highest 5800. This leukopenia was associated with a relative lymphocytosis, the average being 50.9 per cent. The percentage of eosinophiles was less than 4; a few myelocytes were occasionally found.

Bloch[1] emphasizes the importance of the megaloblasts as being the most characteristic cell in the blood, and states that it may sometimes be found only after repeated examinations. The bone marrow may show typical changes in only certain bones, as the ribs and vertebræ; so that specimens for examination postmortem should be taken from several different parts of the body.

Gabriel[2] reports two cases of severe genuine pernicious anemia in

[1] Medizin. Klinik, January 26, 1908

[2] Deut. Arch. f. klin. Med., Band xcii, Heft 5 and 6.

which temporary knot, ring, and whip-like forms appeared in the erythrocytes. A satisfactory explanation for the phenomena could not be given.

Jackson[1] emphasizes the weakness, out of proportion to the degree of anemia, the loss of appetite, and the retention of body weight. He also mentions the presence of paresthesias and the development of paresis or even paralysis, sometimes antedating the appearance of the anemia. He reports three cases.

Remissions are often marked, and may suggest false conclusions from the treatment, as they may appear with or without its influence. Gilbert and Weil[2] report three cases. In one, the remission seemed to be associated with improvement of the gastro-intestinal tract. In the second, anemia and hemolytic jaundice recurred in waves, the patient finally succumbing after a period of great worry and overwork. In the third, recurring hemorrhages played an important role; and here the remissions seemed to be due to the injection of 15 c.c. of diphtheria antitoxin on one occasion, and of simple defibrinated human blood on another.

Bierring[3] uses the blood-findings as an index of the degree of improvement in the patient and of the reactive changes in the hematopoietic organs, especially the bone marrow. This is especially true of the leukocytes, where, with the improvement, there is a disappearance of the leukopenia and of the lymphocytosis. There is also an improvement in the quantitative and qualitative changes in the red cells.

In the discussion of this paper, Freund calls attention to the blood crisis or blood showers which are usually supposed to precede dissolution. He refers to several cases where death did not follow at once. They are supposed to be an attempt on the part of the bone marrow to regenerate, and the administration of arsenic at this time is usually followed with good results, which may persist for sometime.

In the differentiation of pernicious anemia from latent cancer of the stomach the absence of leukocytosis is important. Ceconi[4] reports a case in which all signs seemed to point to latent gastric cancer, but the blood showed a leukopenia of 3000 to 5000. As contrasted with this, he cites two cases with similar red cell counts, one of gastric cancer, with a leukocytosis of 15,000 to 18,000, and one of gastric ulcer, where the white cells rose to 80,000. Strumpell[5] thinks that the differentiation of these two conditions rests largely on a megalocytosis and the higher color index in pernicious anemia. He also emphasizes the pronounced reduction of white cells, especially of the myeloid elements, while the lymphocytes are relatively increased.

[1] St. Paul Medical Journal, January, 1908.
[2] Arch. de. Maladies du Cœur, October 1, 1908.
[3] Journal of the American Medical Association, August 1, 1908.
[4] Riforma Medica, July 6, 1908.
[5] Medizin. Klinik, October 25, 1908.

Rowley[1] reports a remarkable case of anemia which might be included under the pernicious type, in which all types of the leukocytes were found to be actively phagocytic for red and white cells. The patient was a Russian Jew, aged twenty-seven years, with aortic and mitral disease. He was under observation for ten weeks, during which time his red cells fell from 5,120,000 to 1,520,000 and his white cells rose from 42,000 to 800,000 per c.mm., with a relatively high percentage of mononuclear cells. Nucleated red cells and myelocytes were also present.

The most striking feature was the phagocytic power of the mononuclear cells seen in smear on the warm stage. One cell watched for an hour destroyed 27 red cells and 14 polymorphonuclear cells, and one watched for three hours was seen to engulf 67 red cells and 24 polymorphonuclears. The polymorphonuclear cells were also phagocytic. The cells seemed to have an extraordinary vitality when preserved outside the body. The leukocytes from a drop of blood diluted in a pipette with 0.5 per cent. acetic acid showed phagocytic activity and ameboid motility after twenty days. Five drops of the patient's blood diluted with salt solution and injected subcutaneously into a guinea-pig imparted the power of phagocytosis to the animal's leukocytes. This persisted four weeks after the injection. The author suggests as a cause the presence of an autohemopsonin.

Christophers and Bentley[2] report similar experiences with a case of black-water fever. In the films made from blood obtained by splenic puncture there were found a few malignant malarial organisms and a remarkable phagocytosis of the red cells. The phagocytic cells were the macrophages and small cells, each containing a single corpuscle. In both varieties the red cells were either unaltered, partially dehemoglobinized or represented by vacuoles. Phagocytes were present, but scanty in the peripheral blood.

The extreme degree which the reduction of the red cells may reach and yet recovery ensue is well illustrated by a case reported by Stone.[3] A farmer, aged twenty-seven, first became ill in March, 1905, with weakness, palpitation, dyspnea, loss of appetite, and extreme pallor; later, swelling of the ankles and subpalpebral folds. He partially recovered during the summer, and in December, 1905, he began again with malaise, constantly increasing weakness, constant vomiting after taking food, and dyspnea. His blood January 4, 1906, showed hemoglobin minus 10 (Dare); red blood corpuscles, 296,000, being the average of three counts from ear and finger; poikilocytosis was marked; a few normoblasts and megaloblasts were present; white cells, 4800. After treatment with hypodermic injections of arsenite of sodium and of saline solution,

[1] Journal of Experimental Medicine, January, 1908.

[2] Indian Medical Gazette, March, 1908.

[3] Journal of the American Medical Association, April 18, 1908.

the blood showed January 19, 1906: hemoglobin, 20 per cent. (Dare); red blood corpuscles, 1,286,300; leukocytes, 3860. Poikilocytosis was still marked and the normoblasts diminishing. No megaloblasts were found. The improvement was rapid from this time on. The patient was able to resume work as a farmer in May, 1906. On December 28, 1907 (two years from the beginning of the attack), the blood showed hemoglobin, 94 per cent. (Dare); red blood corpuscles, 4,438,000; leukocytes, 4320. Normoblasts and megaloblasts absent. No poikilocytosis present.

Hammond[1] reports a case with very low red cell count, with recovery. The patient was a carpenter, aged forty-six years. Illness had begun two and a half years before the main attack with a severe diarrhea, followed by malaria lasting three months. He had not felt well since, nor had his color been as good as formerly, though he had been able to work for a year after his illness. For five months preceding his admission to the hospital, he had been failing in health, and on admission complained of great weakness, dyspnea, dizziness, tinnitus, blurred vision and failing eyesight, and a feeling as if hot steam were being placed on his neck and the back of his head. He had a soft blowing systolic murmur at the apex and a slight trace of albumin with an occasional cast in his urine. His blood on admission, July 4, 1903, showed hemoglobin, 34 per cent.; erythrocytes, 3,408,000; leukocytes, 2440. There was well-marked poikilocytosis and a few megaloblasts, not typical but transitional forms. He grew progressively weaker until on August 15, when his blood showed hemoglobin, 15 per cent.; erythrocytes, 168,000; leukocytes, 3200; marked poikilocytosis, relatively high color index, and a general increase in the size of reds. There was a moderate number of blasts, the normoblasts being more numerous than the megaloblasts. He then improved until September 1, 1903, when the blood showed hemoglobin, 38 per cent.; erythrocytes, 2,260,500; leukocytes, 5000. July 10, 1908, his blood showed hemoglobin, 85 per cent.; erythrocytes, 4,101,000; leukocytes, 7100. Fowler's solution was mainly depended upon in the treatment.

Treatment of Pernicious Anemia. Nicolaysen[2] has been applying Grawitz's assumption that pernicious anemia is the result of toxins produced from the excessive amount of albumin in the diet. Grawitz suggests lavage of the stomach and restriction of the diet, with nutritive enema, until the secretion of the stomach returns to normal. Nicolaysen reports his results with the treatment in two cases. The first patient, a man, aged thirty-three years, with 1,230,000 red cells and 50 per cent. hemoglobin, was placed on a diet of milk, vegetables, bread, and fruit, and arsenic was given continuously. In two months the red cells had increased to 3,410,000 and the hemoglobin to 80 per cent. The patient continued to improve, so that at the end of four months he was in good health, and

[1] Journal of the American Medical Association, December 5, 1908.
[2] Norsk. Magazine for Lægevidenskaben, October, 1908.

has continued so for four years. The second patient was a man, aged twenty-six years, who had suffered with occasional headaches and vertigo since boyhood, and had always been rather thin and pale. The red cells numbered 2,200,000, and the hemoglobin was 45 per cent. He was placed on a restricted milk-vegetable diet, with iron and arsenic, but the pernicious anemia continued a progressive course, unmodified. Nicolaysen concludes that certain cases of anemia of the pernicious type certainly owe their origin to disturbances in the digestive tract, and that a restoration to the normal in this respect is frequently followed by a rapid and permanent recovery.

Gunn,[1] on the ground of his experimental work, has found that arsenic protects red corpuscles in vitro from the hemolytic action of distilled water. This fact may explain the action of arsenic as a remedy for pernicious anemia. He also suggests that certain facts point to the possibility that pernicious anemia may be caused by a deficiency in the lecithin and cholesterin, making up the stroma of the red blood cells. He therefore recommends the administration of these substances in the treatment.

Reicher,[2] in working with a hemolysin found in cobra poison discovered that cholesterin would limit the production of the anemia following the injection of the hemolysin, and that it would also bring about an improvement after the anemia had been produced. The similarity of this hemolysin to that found in certain parasites by Tallquist, and found in cancer and the gastric mucous membrane by others, suggested its use in the treatment of pernicious anemia in man. He recommends giving 100 grams of a 3 per cent. solution of cholesterin in olive oil. Of four cases so treated, one showed marked improvement for several weeks, and then relapsed and died. One is showing a continuing polycythemia. A third showed some improvement, and the fourth showed no result, while improvement followed the use of atoxyl.

Simon,[3] following Reicher's suggestion, used cholesterin in capsule in six cases of cryptogenetic pernicious anemia, one of which was of the so-called aplastic type. In but one case was a beneficial effect observed, but as the cholesterin was begun in what seemed to be the first attack, too much credit cannot be ascribed to this one factor. In a subsequent relapse, however, the resumption of the cholesterin was again followed by an improvement.

In regard to the use of cholesterin in the treatment of pernicious anemia, Klemperer[4] says that it can in no way be looked upon as a specific form of treatment, but may be used as an adjuvant. Cholesterin will retard hemolysis, and so has a beneficial effect. Whether pernicious anemia

[1] British Medical Journal, July 18, 1908.

[2] Berliner klin. Wochen , 1908, Nos. 41 and 42.

[3] Journal of the American Medical Association, December, 1908.

[4] Berl. med. Gesellschaft, December, 1908; Deut. med. Woch., December 17, 1908.

is to be looked upon as entirely due to hemolysis has not been definitely established, though the experimental results have rather suggested this etiology. Klemperer administers the drug in the manner proposed by Reicher. He also gives milk, cream, and butter (as each contains a considerable amount of cholesterin), giving daily one liter of cream and 200 grams of butter. Eight patients have been so treated, and all have shown a progressive increase in weight and general improvement in symptoms.

Sachs[1] reports the beneficial result of blood transfusion (250 c.c.) in a case of pernicious anemia following puerperal sepsis. Ewald has also noted good results, which, however, were only temporary. The improvement is probably due, in these cases, he suggests, to the formation of antibodies.

In a symposium on pernicious anemia,[2] von Noorden states that about 40 to 50 per cent. of the cases terminate in recovery, and that even malignant cases have periods of remarkable improvement. He has found arsenious acid the most reliable drug, and also lays special emphasis on warmth, sunshine, and fresh air. Mountain climate, in his experience, seems to have done more harm than good. Strümpell obtains beneficial results from small doses of phosphorus, and suggests that saline transfusion or Ziemssen's injections of blood should have a further trial, as they have a stimulating action on the bone marrow. Von Jaksch holds to treatment by the Röntgen rays or the high frequency current, stating that it may yet prove beneficial. Schultze states that Fowler's solution has given long-continued improvement in some cases in his experience. In one case an improvement bordering on a complete cure was obtained by Levico water. The patient was an elderly man.

Aplastic Anemia. As was pointed out in Progressive Medicine, June, 1907 and 1908, aplastic anemia represents a subdivision of pernicious anemia, a type in which the power of regeneration of the bone marrow is lost. This is evidenced chiefly before death by a marked anemia, but without nucleated red cells; and a leukopenia with a relative lymphocytosis. Pappenheim looks upon the condition as a later stage of pernicious anemia, in which, due to the excessive stimulation of the bone marrow by excessive blood destruction, or to a primary toxic action on the marrow, or possibly to both causes, the medullary substance becomes exhausted, or its function depressed, so that it is incapable of blood production. Blumenthal,[3] in discussing a case of severe anemia in a woman, aged forty-two years, with a myomatous uterus and cystic ovaries, comes to the same conclusion, namely, that aplastic anemia is the terminal stage of myeloid anemia—a stage not often seen, as the

[1] Berl. med. Gesellschaft, December, 1908; Deut. med. Woch., December 17, 1908.
[2] Medizin. Klinik, October, 18 and 25, 1908.
[3] Archives des Maladies du Cœur, May 1, 1908.

patient dies or the affection improves. The derangement is the result of repeated hemorrhages and perverted chemical action. Vasomotor disturbances, especially vasomotor dilatations and congestions of the uterus and adnexa, such as occur in young girls and entailing excessive hemorrhages, play an important part in the production of aplastic anemia in the female.

Herz[1] states that aplastic anemia may result from bacterial infection or from the absorption of toxic substances. It may have either an acute or chronic course. The bone marrow shows almost complete disappearance of erythroblastic and myeloid tissue. There is also a partial atrophy of the lymphatic system. In the retroperitoneal and mesenteric glands, where the atrophy is the most marked, there is some indication of a myeloid metaplasia.

Blumenthal and Morawitz,[2] after experimental work on dogs and rabbits, state that in long-continued hemorrhage there are changes in the bone marrow suggestive of an exhaustion of the erythroblastic activity which resemble the changes found in aplastic anemia. The changes in the bone marrow result in an atrophy of the erythrocytes and the granulated cells, and an increase in the leukocytes. The regenerative ability of the bone marrow varies greatly in different individuals, and especially at different ages. In these cases no erythroblastic activity is to be observed in the spleen, lymph nodes, or liver, and no myeloid changes in these organs.

Chlorosis. Very little has appeared during the year on this subject. It is thought by many that the disease is probably due to peculiar disturbances of metabolism associated with the development of the genital apparatus. A rather different idea is presented by Oerum,[3] who says that chlorosis is a specific disease of females appearing during the period when the genital apparatus is undergoing transformation, and is due essentially to an increased amount of blood. The proportional reduction of the hemoglobin occasions the morbid phenomena. The number of corpuscles may be normal. Practically all the measures that prove effectual are seen, on reflection, to act by reducing the amount of blood. Oerum's researches show that the blood pressure is the determining factor for the changes in the amount of blood.

Liwschitz,[4] in an investigation on the *gastric conditions in chlorotics*, found a normal secretion in 44.7 per cent., deficient secretion in 47.4 per cent., and hypochlorhydria in only 7.9 per cent. The motor power of the stomach was generally reduced, the interval before expulsion of the stomach contents being longer the more severe the chlorosis. Ptosis of the stomach was observed in only 19.1 per cent. of 47 cases.

[1] Wiener klin. Woch., 1908, No. 39.

[2] Deut. Arch. f. klin. Med., vol. xcii, Nos. 1 and 2.

[3] Ibid., June, 1908.

[4] Arch. f. Verdauungskrankheiten, February, 1908.

I have[1] called attention to the presence of *enlargement of the thyroid* and the symptoms of hyperthyroidism in association with anemia, especially of the chlorotic type. The symptoms are usually of mild degree, but of such a nature that they seem to be the direct result of the increased secretion of the gland. The enlargement of the thyroid is probably due to simple congestion.

Leukemia. Etiology. Very little in the way of advance has been added during the past year to our knowledge of the various forms of leukemia. The division of the disease into four types—the acute and chronic lymphatic and the acute and chronic myeloid—is being adhered to by most observers. Very few cases, however, of acute myeloid leukemia are being reported.

The question of the relationship of *leukemia to sarcoma* has always been in doubt, and during the last year there seems to have been unusual interest in this phase of the subject. Bushnell[2] reports three cases illustrating this relationship.

Case I.—Leukanemia (or atypical lymphatic leukemia with a leukemic or pseudoleukemic blood picture) in which there was an actual diminution in the leukocytes, but with an increased percentage of lymphocytes; megalocytes and myelocytes were also present.

Case II.—Lymphatic leukemia with malignant lymphomata (mediastinal). The leukocytes in this case were increased to 222,000, of which 65 per cent. were small lymphocytes.

Case III.—Large round-cell sarcoma of the cervical lymphatic glands with an increase of the leukocytes to 13,000, of which 69 per cent. were polymorphonuclear neutrophiles. There were 6.4 per cent. transitional cells—large mononuclears in which the protoplasm has developed scanty fine neutrophilic granulation, the nuclei staining deeper, and of horseshoe or hour-glass shape.

Bushnell concludes as follows: "These cases afford evidence that the glandular enlargements and visceral deposits of leukemia are closely allied to lymphosarcoma, and that pseudoleukemia and lymphadenoma possess the characters of malignant growths.

"In leukemia the lymphocytes may be regarded as elements of malignant character.

"In sarcomatosis and sarcoma of the lymph glands changes may occur in the leukocytes (in the presence of transitional cells).

"No absolute distinction can be drawn between leukemia and sarcoma."

Bushnell also reports[3] a case of generalized sarcoma with blood changes. A female, aged twenty-one years, who had been sick for three and a half weeks, presented three days before death a purpuric eruption, high

[1] New York Medical Journal, September 26, 1908.

[2] Johns Hopkins Hospital Bulletin, November, 1908.

[3] Bristol Medico-Chirurgical Journal, December, 1907.

temperature, enlargement of the spleen and of the liver, and enlargement of the glands of the neck. The hemoglobin was 50 per cent.; the red cells, 2,960,000; the leukocytes, 13,400, with the differential count showing 13 per cent. polymorphonuclears, 37.3 per cent. large lymphocytes, 29.1 per cent. small lymphocytes, 12.6 per cent. transitionals, 1 per cent. eosinophiles, 3.4 per cent. myleocytes, and 2.1 per cent. large hyaline cells. He reports the case as one supporting Banti's view that leukemia is a sarcomatosis of medullary and lymphatic elements.

Harris[1] arrives at somewhat similar conclusions. He discusses five cases of myelogenous leukemia, and is of the opinion that at present it is best to consider myelogenous leukemia a malignant neoplastic disease. He finds support for this opinion in the following clinical factors: the insidious onset, the fatal ending, the development of cachexia without fever, the apparent benefit noted during intercurrent infections, and the favorable influence of the *x*-rays.

Treadgold[2] discusses the neoplastic origin of leukemia, especially of the acute lymphatic form, and at the same time points out some interesting relations between this disease and *chloroma*. He states that both acute leukemia and chloroma appear before puberty, and more frequently in the male sex.

The symptoms of the two conditions agree, and are briefly made up of the following: weakness, marked anemia, hemorrhagic tendency, splenic and glandular enlargement (usually slight), and metastases in the liver, kidneys, and lungs. In chloroma, secondary deposits occur in the orbits, temporal regions, and other cranial bones, in the prevertebral tissue, skin, and other organs, where lymphoid tissue does not normally exist. Similar non-chloromatous growths, however, sometimes occur in these regions in association with lymphatic leukemia.

Histologically, there are rather definite differences. These may be summarized in the following manner. In chloroma, there is more marked infiltration of the walls of the small bloodvessels; metastases are more frequent; the eroding power of the cells is greater; the cells are, on the whole, larger and possess more protoplasm, there being no difference in this respect in the cells coming from the blood, the marrow, and the tissues.

Considerable importance is placed on the increased amount of protoplasm of the cells in chloroma and their consequent increased ameboid movement, as explaining the malignancy of this condition. In acute hemorrhagic leukemia, hemorrhages are usually necessary for the production of infiltrations; while in chloroma the cells in many cases seem to make their way through a degenerated vessel wall. This increased malignancy does not, however, bring about a shorter clinical course, for this depends largely on the secondary anemia.

[1] American Journal of the Medical Science, July, 1908.

[2] Quarterly Journal of Medicine, April, 1908.

The seat of primary growth in acute lymphatic leukemia and chloroma seems to be in the red bone marrow. After the first year of life this becomes proportionately restricted in amount, and by puberty is almost entirely confined to the bones of the skull, vertebræ, ribs, sternum, and epiphyses of the long bones. In all these situations growths have been found.

In acute lymphatic leukemia, the eroding power of the cells is less, so that the tendency toward the formation of subperiosteal tumors is reduced, the cells reaching the blood by normal channels and the tissues through capillary hemorrhages.

While there are a few points suggesting an infective origin for acute leukemia, there are many against such an opinion; and while we cannot look upon the problem as settled, the evidence is gradually accumulating in favor of the neoplastic basis. Aside from the above, there has been no definite advance in explaining the etiology of the various types of leukemia. There seems to be no general confirmation during the year of the presence of spirochetes in the glands in leukemia, lymphosarcoma, and pseudoleukemia, as previously reported by White and Proescher.

Loewit[1] reports the finding of intranuclear bodies in a case of acute leukemia. They were found in the fresh blood and in the blood taken from the jugular vein three hours after death, and appeared within the nucleus of the large and small mononuclear cells as one to four unstained round bodies. Many of them stained with Giemsa stain an intense dark blue and were surrounded by a light area. They were not found in the blood of healthy individuals or of chlorotics, though they were noted in the markedly changed lymphocytes of a carcinomatous lymph gland. In a smear preparation of a lymphatic gland made three hours after death, there appeared a flagella-like body, which was not present in similar preparations from material taken two days later.

Lehndorff and Zak[2] report a case of true myeloid leukemia in which the marrow of the bones consisted of a fibrous tissue poor in cells, while the spleen showed a high grade of myeloid change. They, therefore, conclude that myeloid leukemia should be looked upon as a primary disease, not of the bone marrow, but of the entire hematopoietic lymphatic apparatus, the bone marrow being usually affected along with the rest of the tissue.

An interesting complication of the chronic type of lymphatic leukemia has been reported by Strasser.[3] The case was one of a man, aged forty-two years, whose illness began in the early part of 1906, with enlargement of his abdomen and diarrhea. Several months afterward the blood examination showed 4,000,000 red cells and 437,000 leukocytes, of which 98 per cent. were lymphocytes. A few months later the patient suddenly became dyspneic, due to a serous effusion in

[1] Zentralb. f. Bakteriol., Band xlv, No. 7.

[2] Berliner klin. Woch., March 2, 1908.

[3] Deuts. med. Woch., 1908, No. 9.

the right side of the thorax. Paracentesis revealed a milky, turbid fluid, analysis of which proved to be chyle. The exit of chylous fluid out of the thoracic duct can be explained on the ground of compression of the duct by lymphatic tumors in the mediastinum, or an erosion of the duct without compression.

A very atypical form of leukemia is noted by Lavenson[1] in the report of a case of what he terms *lymphopenic lymphatic leukemia*. The interesting points in the case were the presence of ulcerations of the mouth, the diminution of the absolute number of lymphocytes with no relative increase, and the finding at autopsy of numerous lymphatic deposits in various parts of the body. It seemed as though there must have been some influence inciting the various organs which form leukocytes to a greatly increased production, and yet diminished the rate of their extrusion into the blood current. The ulcerations of the mouth were looked on as being secondary to the leukemic process.

Treatment of Leukemia. Occasionally cases of leukemia are seen in which an intercurrent infection brings about temporary improvement. Samson[2] reports a case of leukemia complicated with noma. During the course of the infection the blood and glands gradually changed practically to normal. After recovery from the infection, however, the leukemic process returned, and death finally resulted. Similar improvements, especially following tuberculosis, suggested to Weitz[3] the treatment of leukemia with a combination of tuberculin and arsenic. Trials with the method have been followed by a marked decrease in the number of leukocytes and a diminution in the size of the spleen. Vaccination and the injection of various sera have been similarly used, but without improvement.

The Röntgen rays have held a prominent place in the therapy of leukemia, especially of the splenomedullary type. In association with Pancoast,[4] I have discussed this phase of the subject at some length. The consensus of opinion is tending to regard leukemia as probably a neoplastic process, originating in the bone marrow, and giving metastases to the various organs; these latter going on to proliferation. The effect of treating with the *x*-rays the spleen or the lymph bodies of leukemic patients may be stated as follows: First, there is destruction of certain cells (namely, mononuclear leukocytes and myelocytes) in the parts treated; second, as the result of such destruction, leukolytic substances are produced and liberated; third, these substances, reaching the bone marrow and other affected parts, destroy a certain number of cells in these situations. To obtain a more direct beneficial and lasting effect on the origin of the disease, and to avoid in a measure the marked

[1] Journal of the American Medical Association, 1908, No. 20.

[2] Berliner klin. Woch., January 27, 1908.

[3] Deut. Arch. f. klin. Med., 1908, Band xcii, Heft 5 and 6.

[4] Journal of the American Medical Association, April 25, 1908.

reactions after treatment due to the destruction of a large number of cells, we suggested the exposure of the bone marrow instead of the spleen and glands. Five patients have been so treated, and the results have fully justified the change in method. Comparatively little attention is given to the total leukocyte count as an index of the effect of the treatment of the disease, while far more is given to the differential counts and to the general character of the blood. The best results follow systematic daily exposures lasting about fifteen minutes. The actual time, however, varies somewhat, depending on the apparatus and the patient. The body is marked off into regions, and each is exposed in rotation and receives three successive exposures. After improvement has been established, exposure of the glands and the spleen may be practised. The results are better in leukemia of the splenomyelogenous type, though some improvement has followed the use of the *x*-ray in chronic lymphatic leukemia.

Von Jaksch[1] advises the elimination of the dangerous rays by the interposition of a thin sheet of silver.

Grawitz[2] has given the results of his experience with the treatment with the *x*-rays. During the last three years he has had under his charge 41 cases of leukemia. In 26 cases with mixed-cell findings in the blood, 12 patients were in the earliest stages, and 10 of these were clinically cured, except that 3 had transient recurrences after a year or two of health. Two of this group were improved, but recurrence soon occurred, and the ultimate outcome is unknown. In 14 cases in which the leukemic process was of several years' standing, one patient has been cured for two years; one died, uninfluenced; the others showed more or less improvement, but no permanent favorable results.

In 15 cases with lymphoid findings, only one patient can be regarded as cured. One has died since of an intercurrent affection; 2 were improved, but have since died of recurrences. The others showed slight or no improvement. Complete restoration to health cannot be expected in the advanced cases, but earlier diagnosis and improved Röntgen technique will certainly improve the prospects of leukemia cases.

Morse[3] reports an interesting sequela of prolonged treatment with the *x*-rays. The patient was a man, aged fifty-five years, with lymphatic leukemia, in whom the blood picture was restored to norma by Röntgen treatment. Almost a year later, signs of cirrhosis of the liver developed, with chronic peritonitis, and death occurred in eight months. Morse ascribes the liver affection to injury of the parenchymatous cells by the toxins following the *x*-ray exposures.

Larrabee[4] has used the *mixed toxins of Coley* in the treatment of

[1] Wien. klin. Woch., April 2, 1908.

[2] Berliner klin. Woch., June 15, 1908.

[3] Ibid., June 29, 1908.

[4] Boston Medical and Surgical Journal, February 6, 1907

leukemia, on the basis of the similarity of sarcoma and leukemia. Four cases are reported: 2 of myelogenous leukemia, one of chronic lymphatic leukemia, and one of acute lymphatic leukemia. Of these, one showed symptomatic recovery lasting for four months; another showed considerable improvement, which, however, was only temporary; the third improved in weight and general condition only; and the acute lymphatic case was entirely uninfluenced.

Splenic Anemia and Banti's Disease. Simonds,[1] after a study of a number of cases of splenomegaly and Banti's disease, is of the opinion that there are two distinct forms of idiopathic anemia and enlargement of the spleen. The one is seen in patients over twenty years of age, in which the condition is characterized clinically by chloro-anemia, leucopenia, splenomegaly, frequently by gastro-intestinal hemorrhages, ascites, pigmentation of the skin, and rarely by jaundice; the spleen shows a fibrous hyperplasia, the liver is frequently cirrhotic, and there are varicose veins in the lower esophagus and cardia. The other type occurs most often in younger people, shows a family tendency, and is characterized by a chloro-anemia, absence of leukocytosis, splenomegaly, a prolonged course, hemorrhages from the nose and gums or under the skin and mucous membranes, and less frequently shows jaundice and pigmentation of the skin; the spleen here shows a diffuse proliferation of endothelium; this same change may also be seen in the liver and retroperitoneal lymph glands.

Donnhauser,[2] in the report of a case of splenomegaly with sclerosis of the bone marrow, states that the term splenomegaly usually refers to an enlargement of the spleen which has extended over a period of months or years. Some authorities, however, include under the term only those conditions in which there is an idiopathic enlargement of the spleen associated with an anemia, or perhaps an anemia with a cirrhotic liver. The causes of splenomegalies are so uncertain that a definite classification on the basis of etiology is impossible. Their origin is usually attributed to some chronic intoxication which acts principally on the spleen, though sclerosis of the splenic and portal vessels and thrombosis of the splenic sinuses have been noted as possible causes. That a diseased bone marrow may be a contributing cause was suggested by the case he reported, though the enlargement of the spleen and the degeneration of the bone marrow may both have been due to some toxin. The patient was a male, aged fifty-eight years, who three months before his death complained of swelling of the lower extremities, dyspnea, and weakness. On admission to the hospital, one month before his death, he had marked dyspnea, edema, and enlargement of the abdomen, due partly to the enlarged spleen. The blood showed a gradual decrease of hemoglobin to 50, the red cells to 3,220,000, and the white cells remained about 9000,

[1] Journal of Infectious Diseases, January, 1908.
[2] Journal of Experimental Medicine, July, 1908.

but with a slight increase in the large mononuclears. He improved for a time, then grew worse, and finally died of asthenia. The bone marrow presented an intense and advanced sclerosis, with a partial disappearance of the true blood-forming elements and their replacement principally by lymphoid cells and fibroblasts. The spleen showed, besides the overgrowth of fibrous tissue, definite foci of true bone marrow elements. The author looks on the spleen in this case as acting in a compensatory manner to offset the deficiency of the bone marrow in the production of blood elements.

Rummo[1] characterizes the signs and symptoms of Banti's disease as follows:

1. Progressive increase or reduction in size of the spleen and change in its consistency.
2. The veins especially of the upper part of the abdomen become more conspicuous.
3. Symptoms of insufficiency of the liver: defective bile production allowing urobilinuria, uro-erythrinuria, bilirubinuria, cholemia, and clay-colored stools; defective transformation of urea, causing hypoazoturia; defective sugar metabolism, causing alimentary glycosuria and levulosuria; defective antitoxic action, increasing the urotoxic co-efficient; and defective elimination of methylene blue. He also gives the following accessory signs:
1. A tendency to hemorrhages.
2. Pain in the liver region.
3. Gastro-intestinal disturbances, dyspepsia, loss of appetite, meteorism, attacks of diarrhea or obstinate constipation, pain in the intestines, and hemorrhoids.
4. Edema of the legs.

Rummo also refers to a type of splenic anemia in adults presenting in many respects a pernicious or leukemic picture.

Warrington[2] describes an interesting case of splenomegaly in a pregnant woman the subject of syphilis. The condition was characterized by anemia and two hemiplegic seizures. At the autopsy there were disclosed, besides the enlarged spleen, a recent cerebral hemorrhage, large mitral vegetations, tuberculosis of one kidney and cystic degenerations of the other. The syphilis, tuberculosis, and recent virulent endocarditis may have been sufficient to account for the anemia and the enlarged spleen.

A leukopenia is usually present in this disease and may become very marked. Levy[3] reports such a case in a woman, aged thirty-four years, who complained first in January, 1898, of pain and soreness in the left hypochondrium. This soreness persisted off and on for about four years.

[1] Policlinic, March 15, 1908. [2] Medical Press and Circular, March 4, 1908.
[3] New York Medical Journal, October 10, 1908.

In 1902 she had an attack of rheumatism; in 1903 she became anemic, the pains in the left hypochondrium became worse, the bowels were irregular, and the gums were red and swollen. Her blood at this time showed hemoglobin, 70 per cent.; red cells, 3,680,000; white cells, 3600; the differential count giving polymorphonuclears, 17.5 per cent.; lymphocytes, 46 per cent.; large mononuclears, 32.5 per cent.; and eosinophiles, 4 per cent. The enlargement of the spleen was first noted in July, 1904. An interesting phase of the disease was the marked reduction of the leukocytes, being as low as 600 in October, 1904. Examination of the gastric contents revealed an absence of free hydrochloric acid and a total acidity of 4.

The anemia, weakness, and enlargement of the spleen increased until August, 1907, when the spleen was removed. Immediately following the operation there was a slight increase of the erythrocytes and hemoglobin and a marked increase of the leukocytes to 1700, then to 14,250, followed by a decrease to 9500. The differential count showed an increase in the polymorphonuclears. In May, 1908, the condition was fairly satisfactory, though there had been no change in the gastric secretion.

Lewis[1] reports an interesting case of splenic anemia with splenectomy and recovery, with studies of the blood covering a period of seven years, four before and three following operation. The patient was a male, in whom slight enlargement of the spleen was first noted in 1900, when he was thirteen years of age. The enlargement gradually increased until 1904, the time of operation. During the four years there was a moderate anemia, with a mild leukopenia. In 1904 a profuse hematemesis occurred shortly after an examination which showed the blood to be practically normal. After the hemorrhages the hemoglobin fell to 18 per cent. and the red cells to 1,100,000. A gastro-enterostomy was performed on the theory of possible gastric cancer, with a general improvement in his condition. Four months later the spleen was removed because of recurring hemorrhages from the bowel and the increased enlargement of the spleen. Accurate study of the blood was interfered with by inflammatory complications—pleural effusion, pericarditis, and wound abscess. The leukocyte count immediately after the operation and during the time of the complications reached 24,000 per c.mm., but fell during convalescence to 10,000, where it remained. The number of eosinophiles was apparently modified by the complications, but showed a general increase, being 1300 per c.mm. two months after the operation; this still persists three years later. The patient is now in good health, takes active exercise, and has had no further hemorrhages. In general the spleen showed an extreme grade of thickening of the walls of the venous spaces, with a diffuse increase in rather cellular connective tissue.

[1] American Journal of the Medical Sciences, August, 1908.

Gibson[1] considered degeneration of the bone marrow a counterindication to splenectomy in a case under his care. The patient, after a railroad accident, suffered from vomiting, distention of the abdomen caused partly by great enlargement of the spleen, restlessness, throbbing in the chest, head, and neck, diffuse pulsation, etc. The blood showed 50 per cent. hemoglobin, 2,250,000 erythrocytes, and 3600 leukocytes, with a slight increase of the polymorphonuclears. Later, abdominal pain, diarrhea, vomiting, epistaxis all became so severe that splenectomy was contemplated. An examination of the bone marrow was now made to determine whether any useful end could be derived thereby. The left tibia was trephined, and the marrow being found in a state of gelatinous degeneration, operative procedures were considered hopeless. Hemorrhages followed from most of the mucous membranes and the kidneys, anasarca, hydrothorax, and hyperpyrexia developed, and death occurred about six weeks later. The postmortem examination confirmed the diagnosis of splenic anemia, and the condition of the bone marrow supported the conclusions reached during life. Interesting in this discussion is a *classification of splenic enlargements* given by Osler:[2]

1. In children, disturbances of metabolism and in chronic intestinal infections: Rickets, amyloid disease, and in a large ill-defined group of intestinal disorders, particularly in the tropics; the pseudoleukemia infantum.

2. In the infections: Syphilis, malaria, kala-azar, and other forms of tropical splenomegaly. Hodgkin's disease and tuberculosis.

3. In primary disorders of the blood-forming organs: Leukemia, pernicious anemia, chlorosis, hemachromatosis; polycythemic splenomegaly.

4. In cirrhosis of the liver: Syphilitic, alcoholic, hypertrophic of Hanot.

5. Hereditary and family forms of splenomegaly: (*a*) With the congenital acholuric icterus: (*b*) with constitutional disturbances, dwarfing, etc.

6. Newgrowths and parasites: Sarcoma, primitive endothelioma of Gaucher (?), echinococcus, and the schistosoma of Japan.

7. Splenomegaly not correlated with any of the above or with any known cause: Banti's disease, with its three stages of (*a*) simple enlargement, (*b*) splenomegaly with anemia, (*c*) splenomegaly with anemia, jaundice, and ascites.

Polycythemia. The interest in this disease seems to be increasing, judging from the number of cases reported. This last year has seen some advance in a better understanding of the various types of the disease and in a better classification. Weber[3] discusses 25 cases of

[1] Lancet, March 21, 1908.

[2] British Medical Journal, October 17, 1908.

[3] Quarterly Journal of Medicine, October, 1908.

polycythemia with splenomegaly and 18 obscure cases of polycythemia reported to date. As the *resume* expresses better than any other article at hand the present ideas on this disease, I shall discuss it at some length. Weber defines polycythemia or "polycythemia rubra" as a condition of the blood in which the number of red corpuscles is decidedly above the average. This increase may be relative and due to concentration of the blood such as caused by a choleraic diarrhea or copious sweating, and is usually only temporary, or it may be absolute when the total number of red cells in the body is increased. The true or absolute polycythemia may be further divided into primary polycythemia, in which the increase of red cells is the primary condition; or it may be secondary, in which the increase in red cells represents an effort on the part of the organism to compensate for some difficulty in the oxygenation of the blood. For the primary form the term "erythremia" is used, and for the latter "erythrocytosis." (This term was used by me in articles on the blood in the *Twentieth Century Practice*, vol. vii, p. 308.) Among the causes to be found for this latter form Weber has found the following:

1. Chronic cardiac and pulmonary disease.
2. High altitudes.
3. Blood stasis not of cardiac or pulmonary origin, *e. g.*, thrombotic changes in the spleen and other organs, cirrhosis or great engorgement of the liver, and disease of the bloodvessels in the limbs.
4. Toxic conditions, *e. g.*, acute phosphorus poisoning, carbon monoxide poisoning, excessive ingestion of some of the coal-tar derivatives—antipyrine, phenacetin, acetanilide.
5. The injection of serum from an animal in which an erythroblastic reaction is in progress or the injection of minute doses of hemolytic serum.
6. Chronic infectious diseases—tuberculosis, syphilis, malaria.
7. Certain local processes affecting the nutrition of the bone marrow, as osteitis deformans, intermittent claudication or commencing gangrene from arterial obstruction in one of the lower extremities.

The causes of erythremia, on the other hand, are not known, except that there is an abnormal activity of the bone marrow thus far unexplained. For this form, Weber proposes the name "myelopathic polycythemia." Other terms previously suggested are splenomegalic polycythemia, myelopathic polycythemia, polycythemia with chronic cyanosis, erythrocytosis, megalosplenica, Vaquez's disease, Osler's disease.

This condition is now being looked on as a distinct disease, and is characterized by a well-marked, persistent relative and absolute polycythemia due to excessive activity of the bone marrow, by persistent increase in the viscosity and total volume of the blood, by enlargement of the spleen, and usually by a cyanotic appearance of the individual.

Etiology of Polycythemia. Most of the signs and symptoms point to an increased erythroblastic activity of the bone marrow analogous

in many respects to what we find in leukemia. Several theories have been advanced to explain this increased production of red cells:

1. That it is due to a toxemia having its source in the spleen, lungs, alimentary tract, etc.

2. That it is the result of a compensatory reaction toward a disturbance in the gas-exchanging function of the blood due to toxins of alimentary or metabolic origin.

3. That increased viscosity of the blood is the primary condition. This, by favoring secondary blood stasis, produces a congestion in the bloodvessels of the lungs and bronchi, with resulting chronic catarrhal changes, cyanosis, and extra work on the right heart. This further increases the polycythemia, and so there is established a vicious circle.

4. Other theories for which there is little evidence depend on blood stasis, increased durability of the red cells, diminished oxygen-carrying capacity of the hemoglobin, possible toxic and infectious causes, as disorders of the gastro-intestinal tract, bronchiectasis acting as in pulmonary hypertrophic osteo-arthropathy, syphilis, malaria, fracture of the long bones, splenic tuberculosis, or a continuance of or reversion to the fetal type of bone marrow in the long bones.

Pathology of Polycythemia. The pathology consists largely of a change of the yellow bone marrow of the long bones to red, thus increasing enormously the amount of erythrocyte-producing tissue. The red marrow is unchanged.

The spleen is usually enlarged and engorged, but with little if any erythroblastic transformation. There is some hyperplasia of the pulp, probably connected with the increased hemolysis present in this disease. Anemic infarcts are frequent. The lymphatic glands are little affected. The visceral bloodvessels are distended, and it is remarkable that there is, as a rule, very little cardiac hypertrophy. These changes, together with the finding of a rather high polymorphonuclear leukocytosis, with occasional erythroblasts and myelocytes in the circulating blood, point to increased activity of the bone marrow as the important factor in this disease.

Stern[1] analyzes the autopsy findings of ten cases of polycythemia in considerable detail.

Symptoms of Polycythemia. These vary considerably, but among the more common are lassitude, headache, migraine, vertigo, sensations of fulness in the head, abdominal pains especially in the left hypochondriac region, dyspepsia, constipation, thirst, and hemorrhage from various mucous membranes. Vascular engorgement and redness or cyanosis vary in different patients and in the same patient at different times. The spleen is moderately enlarged and hard. The urine shows small amounts of albumin, with a normal amount or a slight increase in urobilin.

[1] Medizin. Klinik, January 19, 1908.

Blood Changes. The red cells are increased to from 7,000,000 to 12,000,000, the number being the same in the blood taken from the arteries, veins, and capillaries. The cells are generally rather increased in diameter, but otherwise normal in appearance. A few normoblasts may be found. The hemoglobin may reach 170 to 180, though the color index is usually below 1. The white cells are increased, often as high as 20,000 to 30,000, with a relative increase of the polymorphonuclears. Occasionally myelocytes are present.

The specific gravity of the blood may be raised and the dry residue increased, while the specific gravity and dry residue of the serum are usually diminished. There is an increase in the iron in proportion to the hemoglobin, and of the viscosity in proportion to the red cells; the coagulation time varies; the resistance to hemolysis may be decreased, but is usually normal, and the total volume of blood is greatly above normal.

The course of the disease may be non-progressive or may improve with or without treatment. Death results from sudden exacerbations of cyanosis, complications due to vascular disease of the brain, tuberculosis, and intercurrent causes.

Osler[1] looks on polycythemia, for which he prefers the term erythremia, as an affection of the blood-making organs. He gives the cardinal signs as a peculiar cyanosis, erythremia, and enlargement of the spleen. Other features occurring occasionally are pains in the hands and feet, headache, constipation, high blood pressure, sclerosis of the superficial arteries, a trace of albumin in the urine, bronchitic and asthmatic attacks, hemorrhages (petechiæ, hemoptysis, hematemesis, or hematuria). He looks on cyanosis as the result of overfilled peripheral vessels with a slow current in them and a change in the hemoglobin of the corpuscles. The slow current depends on an increase in the total volume of the blood, increased viscosity of the blood, dilatation of the venules, with loss of tonicity of the peripheral veins.

Müller[2] concludes from his own experience and a study of the literature that there is no direct connection between high blood pressure and the number of corpuscles. On examination of 35 patients with blood pressures of 180 mm. of mercury and above, only two of the patients had an unusually large proportion of red corpuscles. Where hypertension does exist in association with polycythemia, it is usually to be explained by a change in the elasticity of the vessel walls.

Winter[3] reports 12 cases with and without enlargement of the spleen. He does not explain why in some there is this enlargement, while in others it is wanting.

Howard[4] reports a case of polycythemia without enlargement of the spleen and with only a very slight cyanosis.

[1] Lancet, January 18, 1908. [2] Deuts. med. Woch., October 29, 1908.

[3] Medizin. Klinik, July 5, 1908

[4] Journal of the American Medical Association, October 10, 1908.

Mosse[1] reports a case of polycythemia with enlargement of the spleen and a urobilin jaundice.

Herringham[2] reports the case of a woman, aged thirty-five years, with cyanosis, polycythemia, and paroxysmal attacks of dyspnea, in one of which death occurred. He regards the disease as due to some condition acting on the red blood corpuscles, rendering them unfit for the proper performance of their work. This stimulates the erythroblastic tissues to increased production. He found no evidence of increased hemolysis.

Treatment of Polycythemia. Temporary improvement has followed spontaneous hemorrhages or copious bloodletting, especially where the blood pressure has been elevated. Splenectomy has usually proved fatal. Exposure to the Röntgen rays, the administration of arsenic, quinine, thyroid extract, vasodilators are without effect.

On general principles, these patients should avoid muscular fatigue, excitement, impure air, excess of tea, coffee, tobacco, and stimulating meats and spices; they should be forbidden alcohol on account of its action on the peripheral vessels, chalybeate drugs because of their action on the bone marrow, and coal-tar products, as they produce cyanosis. Give a diet free from iron together with some preparation containing lactic acid for its effect on the bacterial flora of the large intestine. Constipation should be prevented.

Lommel[3] reports three cases of polycythemia, and states that repeated venesection gave considerable subjective relief in one of his cases.

The Leukocytes. During the last year considerable interest has been shown in the work of Arneth on the variability of the nuclei of the polymorphonuclear leukocytes. The central idea of his work has been that the youngest polymorphonuclear leukocyte has but a single nucleus, while the older forms have their nuclei broken up into many fragments. In infections the older forms are destroyed first, and with the increased production there appears in the blood a larger number of the younger forms; so that an estimation of the different varieties of nuclei among the polymorphonuclear cells will give some idea of the severity of the infection and the strength of the resistance.

Kothe,[4] instead of grouping the cells in five groups, as suggested by Arneth, determines the number of single-lobed neutrophiles and bases his opinion on them. He has found that cells with single-lobed nuclei in normal blood average 6 per cent. of the total neutrophile count. He has studied 42 cases of simple acute appendicitis, in which the number of leukocytes ranged from 8000 to 20,000, averaging 13,000, while the proportion of mononuclear neutrophiles ranged from 8 to 25 per cent., the average

[1] Deuts. med. Wochensch., December 26, 1908.
[2] British Medical Journal, May 9, 1908.
[3] Münch. med. Wochensch., February 11, 1908.
[4] Berliner klin. Wochensch., September 7, 1908.

being 16 per cent. In 44 more serious cases the leukocytes ranged from 8000 to 50,000, averaging 21,000, while the mononuclear neutrophiles were never below 23 per cent., and in some cases were over 50 per cent. and even up to 65 per cent. of the neutrophile count, the average being 39 per cent. This predominance of the mononuclear neutrophiles indicates the severity of the infection. If the blood picture does not tend to become normal after operation, some complication exists, and if at the same time the total leukocytic counts grow lower, this must be looked on as a bad omen.

Griffiths[1] is of the opinion that Arneth's work has not received the attention it deserves. He uses Jenner's stain, a modification of Romanowski's eosin and methylene blue stain, in preference to Ehrlich's triacid stain, as suggested by Arneth. He considers the method of more service than the opsonic index, which is not direct and absolute and is subject to marked changes as the result of food, exercise, or emotion.

Kostling[2] has studied the connection between leukocytosis and inflammatory affections in 225 cases. He agrees with Arneth that the destruction of leukocytes is necessary to form antibodies with which to combat the invading infection. The height of the leukocytosis is dependent on the production of leukocytes, and this in turn on the amount of toxins absorbed, as the latter acts as a stimulus for the leukocyte-producing apparatus. When the system is unable to produce ripe leukocytes fast enough to take the place of those destroyed in the production of antibodies, it sends out more and more immature cells. The leukocyte count, therefore, will show the relative leukocytosis, and the polymorphonuclear neutrophile count will give the absolute leukocytosis and the amount of destruction of leukocytes going on. The leukocyte count is principally valuable for prognosis and control of the progress of the affection; in diagnosis in combination with other measures it may afford valuable information and may be important in regard to indications for treatment.

Lymphocytes. Ehrlich has previously shown that an increase of lymphocytes in the circulating blood is due, apart from changes in the productive activity of the lymphoid tissue, to a flushing out of the cells through an increase in the lymph flow. Rous,[3] in a study of the rate of flow from the thoracic duct and the number of lymphocytes thus entering the blood in dogs, has arrived at the following conclusions:

1. The lymph of the thoracic duct furnishes to the blood a larger proportion than is usually supposed of the lymphocytes in circulation.

2. The quantity of lymphocytes supplied through the thoracic duct of the healthy dog remains practically constant from hour to hour if the physiological conditions are not notably changed. Transient changes

[1] Australasian Medical Gazette, September, 1908.

[2] Mitteilungen aus den Grenzgebieten der Med. und Chir., vol. xviii, Nr. 4.

[3] American Journal of the Medical Sciences, March, 1908.

may alter the output, but later the output tends to resume its previous rate. These facts indicate that the tissues producing lymphocytes are "set" at a rate of activity definite in the individual.

3. Muscular activity produces a prompt increase in the output of lymphocytes through the thoracic duct.

4. Increased lymph flow caused by a lymphogogue of the second class (glucose) causes also increased output of lymphocytes through the thoracic duct.

5. A comparison of the effects of struggle and those caused by glucose demonstrates that in the former some factor besides an increase in the lymph flow per se works to cause the large output of lymphocytes. The nature of this factor is not yet determined.

6. Variations caused by muscular exertion and increased lymph flow in the number of lymphocytes coursing through the thoracic duct are so pronounced as to suggest that the total number of lymphocytes in the circulation must be influenced by them. Clinical findings indicate the same.

7. Results in general prove the existence, reserved from circulation, of a large fund of lymphocytes, which is quickly yielded to the blood under certain physiological conditions.

In a later communication[1] the same investigator found a marked increase in the output of lymphocytes from the thoracic duct following the intravenous injection of pilocarpine nitrate. He suggests that the real cause for this quickened flow may be from contraction of smooth muscle fibers. This is another support for mechanical factors in the production of a lymphocytosis.

Large Mononuclear Leukocytes. The origin of this group of leukocytes has never been definitely determined. Elliot[2] states that the term does not refer to a cell entity, but to a group more or less poorly defined, the members of which have similar tinctorial and morphological characteristics. In stained smears, it is impossible to differentiate the different varieties accurately. The group contains, according to Elliot, Ehrlich's large mononuclear leukocytes, large and atypical lymphocytes, "lymph schotton," plasma cells, "markzellen," and many unidentified cells. Until some method of differentiation can be determined, these cells must be included in the one group, but with the understanding that they come from entirely different origins and are of entirely different significance.

Hemoglobin Estimations. There have always been considerable discrepancies in the comparisons of estimations of hemoglobin with different instruments or methods. An explanation for these variations has been suggested by Oerum.[3] He states that there are two elements in the

[1] American Journal of the Medical Sciences, May, 1908.

[2] Quarterly Bulletin, Northwestern University Medical School, September 1908.

[3] Deuts. med. Wochensch., July 9, 1908.

hemoglobin: one, the hemochrome or color-containing, and the other the hematin or iron-containing element. Some methods, chiefly the Fleischl-Miescher, use the former as an index of the amount of hemoglobin; and others, especially the Sahli, use the latter. Oerum had previously shown that the number of red corpuscles in the blood might vary considerably without a corresponding change in the percentage of hemoglobin, as determined on the hemochrome basis. When, however, the amount of hematin was used as the basis, there was a direct proportional variation. The oxygen-carrying capacity seems to vary with the hemochrome. He points out the fact that the blood of the Swiss, living in a higher altitude than do the Danes, contains only four-fifths the amount, of hematin found in Danish blood, while it can bind fully as much oxygen as the latter. Its functional value is, therefore, 1.25 in comparison with Danish blood.

The Erythrocytes. A peculiar granular appearance and fragility of the red cells is noted by Chauffard[1] in certain cases of hemolytic *jaundice.* This characteristic may be of importance in some cases, as a differential sign between obstruction and hemolytic jaundice.

Kramer[2] has given the results of examinations of blood from the ear, finger, and toe of bedridden patients with various circulatory disorders. In cases of defective circulation, he has found an accumulation of red corpuscles in the blood from the toe; the specific gravity of the blood from the toe is also increased. This difference between the blood from the toe and that from the ear is a sign of deficient cardiac action.

Viscosity. This subject is receiving considerable attention at the present time, the interest being manifested chiefly in the finding of a method for its determination which shall be accurate and at the same time simple enough to be useful for clinical purposes. The majority of the methods so far proposed are based on the determination of the time required for a certain quantity of blood to pass through a given portion of a tube, as compared with the time required for an equal quantity of distilled water to do the same, under the same conditions of temperature and pressure. As thus determined, the average normal viscosity of blood is between 4.5 and 5.5. McCaskey[3] has described one of the best known of these methods, performed with the apparatus of Hirsh and Beck, and modified by Determann, Bence, and others. He also describes a simple method of his own, which involves much the same principles. It consists in the use of a capillary pipette, similar to those used in opsonic work, to the expanded end of which a rubber bulb may be applied to exert negative pressure. Marks are made on the capillary tube, so that distilled water will pass from one to the other, under negative pressure, in about five seconds. The clinical applica-

[1] Semaine médicale, January 29, 1908.

[2] Wien. klin. Wochensch., August 20, 1908.

[3] Journal of the American Medical Association, November 14, 1908.

tion of the method and the conclusions deduced from the study of a number of cases may be seen in the following conclusions:

1. The viscosity of the blood is an important physical property, dependent on both the corpuscles and the plasma, which furnishes a considerable part of the peripheral resistance to the circulation of the blood.

2. It undergoes considerable fluctuations, as a result of physiological changes connected with food, drink, exercise, etc.

3. Under pathological conditions the changes are much greater, and the viscosity may be so much increased—as, for instance, when the blood is charged with CO_2—that the heart will be embarrassed in overcoming it.

4. The viscosity of the blood is actually low in the large majority of cases of chronic Bright's disease, owing to existing hydremia; but there is probably an earlier stage with high viscosity.

5. It seems probable that an increased peripheral resistance to the circulation of the blood, due, in part, to increased viscosity, is at least one of the factors in the production of the cardiac hypertrophy of Bright's disease.

6. Venesection greatly lowers the viscosity of the blood, by withdrawing its solids and attracting the fluids from the surrounding tissues.

7. Alcohol introduced into the circulation greatly increases viscosity, and in this way interferes with the peripheral circulation and burdens the heart.

8. The approximate determination of the viscosity of the blood, as a routine clinical procedure, is desirable in nutritional and toxic disorders; and should be made by a method rapid and simple enough to be practicable for routine use.

9. Individual diseases do not change viscosity in any characteristic way, except as they incidentally modify the blood.

10. The determination of viscosity should be made promptly, before the corpuscles have time to settle, for obvious reasons. The use of hirudin, if it leads to considerable delay, is, therefore, objectionable, unless the homogeneous mixture of plasma and corpuscles is again reproduced.

11. The viscosity of the blood is not altogether dependent on its specific gravity, for in fevers the former may be high and the latter very low.

Bachmann[1] suggests a determination of the viscosity of the blood in connection with the estimation of the hemoglobin, as it has been found that the hemoglobin divided by the viscosity gives a quotient that is nearly constant in health, but varies widely in different diseases. He has found that in pneumonia and epidemic meningitis the viscosity is increased, while in typhoid fever and chronic interstitial nephritis it is reduced. In thrombosis it may range from average to maximal figures.

[1] Deut. Arch. f. klin. Med., vol. xciv, Nos. 3 and 4.

The difference between the viscosity of arterial and that of venous blood depends, according to Burton Opitz,[1] upon the content of CO_2, being higher with increased amounts. It is especially high in narcosis and suffocation, while the laking of blood causes a marked lowering of the viscosity. Of the formed elements, the red blood corpuscles especially influence the viscosity. Injections of gelatin in animals and the eating of meat cause an increase.

Boveri,[2] after studying the viscosity of twelve patients with hypertension from various causes, finds that the blood becomes more viscid with arteriosclerosis and old age; and that treatment with iodides renders the blood more fluid in inverse proportion to the severity of the case. This gives an explanation for the favorable action of iodine in cardiovascular affections.

Determann[3] has tested the viscosity at various altitudes. He finds no change in the case of distilled water, so he feels that pressure cannot be important. Individuals coming from an elevation of 280 meters to an elevation of 1840 meters showed, after three to eleven days, an increase of viscosity amounting to an average of 17.4 per cent. After ten to twelve days, in most persons, the viscosity falls to below normal and then rises to about normal. In some the high viscosity is retained for months or even years. The viscosity seems to vary with the albumin content of the blood. At higher levels the red blood cells are increased in number, a change to the same altitude as above being associated with an average increase in the cells of 31.5 per cent. Determann, therefore, concludes that each cell is not of equal value in albumin content at high altitudes. He suggests that as the question is more studied we shall doubtless find that the viscosity varies with slighter influences, which are affecting us in daily life; such as barometric pressure, electrical activity of the atmosphere, and physical, medicinal, and dietetic measures.

Coagulation of the Blood. This subject has claimed some attention during the past year, especially along the line of finding a satisfactory method. Cuiffini[4] has proposed a method similar in technique to that of the hemolytic blood tests, and depending on the coagulation time of various dilutions of the blood. He found normal time in cases of cirrhosis of the liver, chronic jaundice, and simple tertian malaria. The coagulation process was increased most in typhoid fever, and was most retarded in hemorrhagic purpura, estivo-autumnal malaria, and malignant disease of the liver.

M. Solis Cohen[5] has devised an apparatus based on Milian's method, which eliminates the errors due to evaporation and changes in temperature. With this instrument he has made 540 observations on the coagulability of the blood in 100 cases of *tuberculosis*. He found that the

[1] Pflüger's Arch., Band cxix, Heft 6 and 8.
[2] Presse méd., August 15, 1908.
[3] Medizin. Klinik, May 31, 1908.
[4] Policlinico, February, 1908.
[5] University of Pennsylvania Medical Bulletin, August, 1908.

average clotting time of all the cases was five and one-sixth minutes, being practically the same in the different stages of the disease. (The clotting time of normal blood with this instrument is eight and two-thirds minutes.) The results show that persons with increased coagulability are probably less liable, and that those with deficient coagulability are probably more liable, to hemorrhage than are persons whose clotting time is normal. Cases examined before a hemorrhage showed an average clotting time of seven and one-eighth minutes, while in those examined during a hemorrhage the time was four minutes. Hemorrhage was less severe and diminished more rapidly in cases whose clotting time was short or normal than in those in whom it was delayed. Diarrhea and menstruation did not influence the coagulability. Pleural effusion seemed to lengthen it.

Fox,[1] using Wright's tubes, finds that the coagulation time immediately after delivery is below the normal, but not to the extent that is commonly supposed. He found the average to be five and one-quarter minutes. After the first day the time lengthens, probably owing to the loss of calcium with the milk.

Nias,[2] after testing the coagulability of blood after the administration of various drugs (using Wright's tubes), concludes that the glycerophosphate and lactophosphate of the lime are practically inert, probably because they are not assimilated. The lactates, chlorides, and carbonates give better results, because they are better absorbed.

Robertson, Illman, and Duncan[3] have studied the coagulation time in a number of patients with or recovering from *typhoid fever*. They found 41 out of 60 cases with an extended clotting time. Hemorrhages usually caused a rapid lessening of the coagulation time. They were unable to reduce the time by the administration of calcium salts, but did obtain fairly satisfactory results in lengthening it by the administration of citric acid.

HODGKIN'S DISEASE.

The relationship of the various diseases of the lymphatic glands has always been confused; and with the more exact methods of examination in recent years, the number of different types have increased, so that at the present time we are in great need of some definite classification Hirschfeld[4] has attempted to unravel some of the confusion and to limit certain terms in their application. According to him, the term "pseudoleukemia" should be reserved for a condition showing the lymphatic changes of a leukemia, but without the blood changes of leukemia—really an aleukemic leukemia. Two types may be distinguished—a

[1] Lancet, January 11, 1908.
[2] Ibid.
[3] Journal of the American Medical Association, May 16, 1908.
[4] Berliner klin. Woch., December 14, 1908.

lymphadenoid type and a myeloid type. Of these, the former is the more frequently seen, and is characterized by a chronic course, an increase of the lymphocytes in the lymphatic glands and spleen, and in small deposits in the other organs, with the evidence of a more or less marked anemia and a relative lymphocytosis, but with no, or very slight, increase in the total leukocyte count. The myeloid type is comparatively rare, and is characterized by a myeloid and leukemic change of the blood-forming organs, but with no marked increase in the leukocytes, though myelocytes are usually found; there is also a rather marked anemia.

From pseudoleukemia, thus defined, Hodgkin's disease is to be separated; and for the latter, Hirschfeld suggests the name proposed by Benda—malignant granuloma—as giving a better idea of the lesion. There may be a close resemblance between this condition and true pseudoleukemia, especially if the glands are particularly hard and firm. The disease may be found attacking any group of glands, may or may not be associated with enlargement of the spleen, and may have an acute or chronic course, with or without fever. The glands, on histological examination, show that the true lymphatic tissue is almost entirely replaced by a granulation tissue consisting of eosinophile cells, epithelioid cells, mast cells, and fibroblasts. Small areas of necrosis are also sometimes noted.

The presence of necrosis and, in some cases, of tuberculous foci has led Sternberg to believe that all of these affections of the lymphatic glands are tuberculous. This view cannot be held, in the light of later investigations. Splenic anemia and Banti's disease are to be distinguished from the foregoing, as are also the forms of lymphadenopathy following malarial or syphilitic infections.

Considerable interest was shown, during the latter part of 1907, over the report of White and Proescher on the finding of *spirochetes* in certain glands of pseudoleukemia.[1] Later,[2] they reported similar findings in fourteen cases of pseudoleukemia, acute lymphatic leukemia, and lymphosarcoma. The organism was passed through four generations of guinea-pigs, and could then be recovered from the glands. No confirmation of these reports has been made.

Lincoln[3] has reported an interesting case of Hodgkin's disease with *eosinophilia*. The patient was a boy, aged fifteen years, whose illness had begun with enlargement of the glands of the neck, axillæ, and groins, followed by weakness, diarrhea, nausea and vomiting, and edema. The blood showed 40 per cent. of hemoglobin, 1,470,000 erythrocytes, and 47,000 leukocytes, with the following differential count: Polynuclears, 27.4 per cent.; small lymphocytes, 0.6 per cent.; medium-sized

[1] Progressive Medicine, June, 1908.

[2] New York Medical Journal, January 4, 1908.

[3] Boston Medical and Surgical Journal, May 7, 1908.

lymphocytes, 2.6 per cent.; large lymphocytes, 0.6 per cent.; transitionals, 0.6 per cent.; and eosinophiles, 68.2 per cent. During the last few weeks of his illness, his temperature was slightly elevated and irregular. The course of the disease was about seven months.

Coley[1] holds to the theory that Hodgkin's disease is really a type of sarcoma, supporting this idea by citing a case in which there was marked infiltration of the capsule of the glands, fascia, muscle, periosteum, and bone, similar to that of a malignant tumor. He also reports a case treated with the *mixed toxins of erysipelas and Bacillus prodigiosus.* A male, aged twenty-four years, had first noted enlargement of the glands on the right side of the neck a year before. This was soon followed by enlargement of the axillary glands and the glands of both groins. The red cells numbered 4,070,000; the leukocytes, 4050; and the differential count showed 62 per cent. polynuclears, 18 per cent. large lymphocytes, 17 per cent. small lymphocytes, 3 per cent. transitionals. The toxins were injected into the pectoral region. Following the injection there was an active febrile reaction, which lasted for over a week. After fourteen injections, the tumors of the neck, axillæ, and groin had practically disappeared; and the spleen was just barely palpable.

EXOPHTHALMIC GOITRE.

Etiology of Exophthalmic Goitre. This disease is known by many synonyms, some descriptive, others applied with the idea of doing honor to the man who first described it. Dock,[2] in a critical review of the literature, points out that the term "Basedow's disease" is the one most generally used, as the first clear and definite description of the disease was reported by Basedow, though reports of cases by Flajani, Parry, Adelmann, and Graves had appeared earlier. Basedow discussed the literature on the subject, attempted to explain the nature of the disease, and to give it a place in pathology. The term at the head of this article is objected to because of its late introduction, its impurity of derivation, and the fact that it has to be changed to "struma exophthalmica" to Latinize it, and struma is a word of doubtful meaning.

Steffenson[3] defines exophthalmic goitre as "an affection of the thyroid gland resulting in an increase or perversion of its secretion to the point of influencing unfavorably the nutrition and functions of any or all the tissues of the body." He takes exception to the common belief that worry shock, etc., may act as causes and is inclined to look on them as the last straw added to an already fairly developed diseased condition. In this latter conception he is in accord with the ideas of many other writers.

[1] Journal of the American Medical Association, January 4, 1908.

[2] Ibid., October 3, 1908.

[3] Illinois Medical Journal, January, 1908.

Gullan[1] states that while the symptoms may often start after fright, excitement, worry, etc., more probably the disease was preëxistent and only came to light after the shock. Gullan also emphasizes the fact that it occurs more frequently in women during the period of sexual activity, while myxedema and cretinism is more often seen before puberty and after the menopause. The disease sometimes occurs in families and so may be inherited, though Grober[2] believes that there seems to be rather the transmission of a general constitutional weakness, with a predisposition to develop certain allied affections. He reports three cases in the same family, a brother and sister in the fifties and a niece of twenty-five. The family history showed that the older patients had apparently healthy parents, but an uncle and his son had diabetes. They, moreover, had two healthy brothers, but the children of one brother included the niece with exophthalmic goitre and one epileptic, while four others died young. He also is of the opinion that by avoidance of certain factors it is possible for the members of such families to escape the effects of their inherited tendency and to develop into healthy adults.

Solis[3] states that there are three principal theories as to the etiology of exophthalmic goitre: (1) Toxic, the toxins being derived from disturbances in the digestive tract; (2) thyroid, the symptoms being due to hypersecretion of the thyroid gland; (3) neurotic, there being a disturbance in the relations between the sympathetic nervous system, the pituitary gland, and the thyroid. Each of these theories is supported by a certain amount of evidence. In the pathological findings most attention has naturally been given to the thyroid gland, in which there has usually been found an increased vascularity.

During the last year considerable attention has been devoted to the relation of the activity of other glands of the body with an internal secretion to the function of the thyroid gland. Hoffman[4] believes that the thyroid and the *suprarenals* are antagonists, and that the former has much to do with the functioning of the splanchnic nerve. The *hypophysis* can act vicariously for the thyroid to a certain extent, while the functioning of the *ovary* rises and falls with that of the thyroid.

Extract of testicle acts like suprarenal extract in increasing muscular energy. When a gland with internal secretion is doing extra work, its antagonist also has to increase its functioning to keep up with it, or the balance is lost and the excessive functioning of the one gland is accompanied by deficient functioning in its antagonist. In exophthalmic goitre, for example, the excessive functioning of the thyroid is accompanied with deficient functioning of the suprarenals. In myxedema, on the other hand, the relation is reversed and there is excessive activity of the suprarenals. He found that the pupil of the frog dilated under

[1] Lancet, September 5, 1908. [2] Medizin. Klinik, August 16, 1908.
[3] Michigan State Medical Society, June 24, 1908.
[4] Münch. med. Woch., February 11, 1908.

the influence of an extract of certain glands and contracted under the influence of others. The practical results of this study are that affections of the various glands should be treated with organotherapy from the antagonist glands. He has found the serum of thyroidectomized sheep of value in the treatment of osteomalacia, mongolism and abortive forms of myxedema. He thinks that ovarian and testicular extract would probably prove still more effective in these latter cases. The serum of thyroidectomized sheep is also of service in hay fever and bronchial asthma, in hemorrhage and diabetes. On the other hand, the pupil contracting substance in the serum of patients with abortive myxedema and mongolism might be of advantage in the treatment of glaucoma.

Krauss and Friedenthal[1] have also done considerable research work to confirm the physiological antagonistic action of the internal secretions of the thyroid gland and the adrenal.

Congenital goitre is sometimes seen. Fahre and Thevenot[2] found 130 cases on record. Heredity seemed to be a factor of some importance in a number of the cases. The goitre may appear as a mild, severe, or fulminating condition, the mild form being by far the most frequent. Syphilis in the parents was seldom noted, nor were there any signs of syphilis to be found in the children later. They suggest the drinking water taken by the mother as a probable cause of the disease in the infant, though predisposing causes, such as persistence of the fetal circulation, compression during delivery, and congestion from screaming and writhing, may have considerable influence in etiology.

Kienbock[3] describes 11 cases of *intrathoracic goitre* and reviews the cases previously reported.

Crummer[4] discusses the *Charcot type of exophthalmic goitre.* This is a form of goitre in which the exophthalmos is wanting and where the enlargement of the gland itself is very slight. Tachycardia and tremor are the main symptoms of the condition. The disturbance occurs in young women about twenty years of age who have suffered from anemia, emotional irritability, periods of poor health, and who have usually been more or less brilliant mentally. The goitre is, as a rule, small, soft, and diffuse, the tremor fine, heart overactive, pulse a little rapid. The patient will complain of palpitation and frequency of heart action which keeps up day and night, the patient usually feeling the best in the afternoon. The condition is probably due to perverted action of the gland; this form never changes to the typical type. In the way of treatment, measures to overcome the anemia, constipation, and extreme emotionalism of young girls are indicated, also rest, forced feeding, with the administration of vasomotor and general stimulants.

[1] Berliner klin. Woch., September 21, 1908.
[2] Revue de Chirurgie, June 19, 1908.
[3] Medizin. Klinik, April 5, 1908.
[4] Medical Fortnightly, October 26, 1908.

Pathology of Exophthalmic Goitre. Wilson[1] has found an almost complete parallel between the conjectures from pathological specimens of exophthalmic goitre and the clinical symptoms in about 80 per cent. of cases. He divides the cases into two series: (1) Those with increased parenchyma within the alveoli, and (2) those with increased number of alveoli. In each series he places several groups—one with but a small amount of parenchyma and increased secretion; one with a large amount of parenchyma and increased secretion; a third like the preceding, but with beginning degeneration; and finally, one with more or less complete degeneration. He suggests the following simple hypothesis of the development of the disease:

1. Following a metabolic, chemical, or extra-organismal irritant, the thyroid parenchyma proliferates, overfunctionates, and degenerates.

2. This process primarily resembles simple adenomatous proliferation or reminds one of adenopapilloma.

3. Either process may start in a gland not previously enlarged by retained secretion, or in one which is already distended with non-absorbed secretion.

4. The severity of the symptoms depends upon (*a*) the amount of absorbable secretion, and (*b*) the patient's ability to neutralize the secretion.

From his studies he associates the clinical symptoms with the following pathological changes:

1. Very early acute cases show pathologically hyperemia and cellular hyperplasia, if not throughout the gland, at least in the more enlarged lobe.

2. Later acute, moderate, severe, and very severe cases show greater parenchyma increase, and in many instances evidence of increased absorbable secretion. Speaking broadly, the parenchyma increase is in direct proportion to the intensity of the symptoms. The relatively few variations from this rule may be accounted for by the varying resisting powers of different individuals. When relatively small amounts of absorbable secretion are found in alveoli whose walls are crowded with actively functionating cells, we may fairly assume that the secretion has already been absorbed.

3. Cases which clinically are showing any remission of toxic symptoms show somewhere within the gland more or less evidence of decreased function in the exfoliation or marked flattening of parenchyma cells, or of probably decreased absorption by the presence of thick, gelatinous, stainable secretion, the so-called "colloid."

4. Patients who have recovered from their toxic symptoms and are now suffering principally from long previously acquired heart or nerve lesions, or from myxedema, show exfoliated or much flattened epithelium and large quantities of well-stained, thick, gelatinous, probably non-absorbable colloid. In this class of cases it seems as futile to search for

[1] American Journal of the Medical Sciences, December, 1908.

previous causative parenchyma increase as to look for diphtheria membrane in the throat of a patient suffering from postdiphtheritic paralysis.

5. The recently developed, very mild, or moderately mild cases of long standing show pathologically almost always some total parenchyma increase by the multiplication of alveoli, but apparently not greatly increased functionating power of the individual parenchyma cells. Goitres of the adenoid type apparently pass through the same changes of hypertrophy and degeneration as those of the papilliferous type.

6. Simple goitres should be regarded as multiple retention cysts filled with non-absorbable secretion, cell detritus, etc.

Symptoms of Exophthalmic Goitre. A very good *resume* of the symptoms of this disease is given by Jackson and Mead,[1] based on 85 well-marked cases seen in the Out-patient Department of the Massachusetts General Hospital. In the majority of the cases no definite cause could be ascertained for the disease. Of the 85 patients, 80 were women and 5 men; of the women, 42 were or had been married, and 28 were single; of the men, 2 were married and 3 were single. In age the youngest was sixteen; 8 were between sixteen and twenty years; 26 between twenty-one and twenty-five; 39 between twenty-six and thirty; 14 between thirty and thirty-five; and 8 between thirty-five and forty. The previous histories were, as a rule, good, and the family histories almost wholly negative. In 21 cases goitre was the first symptom, followed rapidly by exophthalmos, tremor, palpitation, weakness, tachycardia, emaciation, or nervousness and irritability, while in 18 others the goitre persisted for eighteen years before the other symptoms came on. In 62, palpitation was the first symptom to be noticed. In 38 cases the enlargement of the thyroid gland was symmetrical, in 32 the right lobe, and in 14 the left lobe, was the larger. The consistency of the gland was usually elastic or soft, being hard in only one instance. In 12 cases there were well-marked pulsations, and in 68 a thrill was present. A systolic murmur could be heard over the gland in 76 cases, in 9 a diastolic murmur, both varying in character from time to time.

Palpitation and tachycardia were frequent. In 58 cases, the pulse rate was between 120 and 140; in 12, between 100 and 120; in 8, between 110 and 120; but under excitement it would rise to 190 and 200. Visible pulsations, flushing, and coldness of the extremities were very common. The apex beat was displaced to the nipple line or beyond in 70 cases; it was usually distinct and strong; arhythmia was frequently noted during examination. In 33 there was a murmur at the apex, systolic in time, and transmitted similar to the mitral regurgitant murmur. In 11 of these cases there was a systolic murmur at the base. The pulse was usually described as of high tension, though the average fell between 130 and 140 mm. Twelve of the severer cases had edema, usually of the legs only. In 20, the four cardinal eye signs—exophthalmos, von Graefe's,

[1] Boston Medical and Surgical Journal, March 12, 1908.

Stellwag's, and Moebius' signs—were all present: exophthalmos, von Graefe's and Moebius, in 8; exophthalmos and von Graefe's in 8; exophthalmos and Stellwag's in 10; exophthalmos and Moebius' in 4; exophthalmos alone in 20. Tremor was common to all; this was fine, varying from 6 to 10 a second. Agitation and restlessness, dyspnea, and insomnia were common. All complained of weakness. Seventy-eight had well-marked loss of weight. The temperature was increased in only the very severe cases. An unusual tendency to sweating was noted in 80. In 33 there was excessive pigmentation on the flexor surfaces or the abdomen. Falling of the hair was very common. The cervical lymphatic glands were often enlarged, and in 6 the spleen also.

Nausea, vomiting, and diarrhea were frequent symptoms, especially the latter, occurring usually in attacks. In the diagnosis of the disease especial importance is to be placed on the presence of a murmur heard over the goitre. This murmur occurred in 87 per cent. of the cases of this series.

The blood shows changes in this disease, which may often prove helpful in arriving at an early diagnosis. Kocher[1] has examined the blood of 106 cases of exophthalmic goitre, from which he draws some interesting conclusions. The number of red corpuscles were always found to be normal in number or even above normal. The white cells, however, usually ranged about 5000 instead of the normal 7000 or more. The reduction seemed to be exclusively at the expense of the neutrophilic polymorphonuclears, while the lymphocytes were relatively or absolutely increased. This reduction of the polymorphonuclears is of importance in explaining the dangers not only of thyroidectomy, but of operations on other organs. The task of rendering harmless the consequence of acute infections devolves principally on the neutrophiles. They contain ferments which have antitoxic, peptic, oxidizing, and chemotactic properties. Operations cause ferment intoxications by effusions of blood and toxic influences from the general anesthesia, necrosis of bone, etc., and so depress the normal activity of the ferments. The blood picture begins to change toward the normal after effectual operative intervention.

Caro[2] finds the same reduction of polymorphonuclear leukocytes, sometimes as much as 50 per cent., in pronounced cases of the disease, with a corresponding increase in the mononuclear leukocytes, especially of the small lymphocytes. He tabulates the blood findings in 14 typical cases, 20 with suggestive symptoms, 6 with goitre alone, one some years after recovery, and 5 in which thyroid treatment was being taken for obesity or myxedema.

Kocher[3] also calls attention to the phenomenon that if the hand of the patient is held on the level with the eyes and is suddenly lifted a little higher, the upper lid springs up more quickly than the eyeball.

[1] Archiv f. klin. Chirurgie, vol. lxxxvii, No. 1.

[2] Berliner klin. Woch., September 28, 1908.

[3] Loc. cit.

For a moment the eye has the same aspect as with permanent retraction of the lid (Stellwag). Tenderness of the enlarged thyroid is another important early symptom.

Salmion[1] reports two cases of exophthalmic goitre with *fat diarrhea*. In one the diarrhea was referable to obstruction of the smaller passages of the pancreas. In the other it was the result of a disturbance in the intestine similar to the condition occasionally found in neurasthenics.

Schrotter[2] calls attention to *pigmentations of the skin* similar to those of Addison's disease. In one case this discoloration extended over the entire body. He refers to Lowi's recent work, which demonstrated the existence of mutual relations between the organs with internal secretion. These facts suggest the participation of the suprarenals in the syndrome of exophthalmic goitre, while the parathyroid glands have nothing to do with it.

Cerioli[3] reports a remarkable case of *hypertrophy of the mammary glands* associated with exophthalmic goitre in a man aged fifty-two years.

In a certain per cent. of cases of this disease *death* results from asystole. Mouriquand,[4] in a review of 206 cases of exophthalmic goitre reported in the literature, found 30 in which death occurred from asystole. On closer study, however, 5 showed aortic lesions, 12 mitral lesions, and 3 combined lesions. He also describes a case in which the exophthalmic goitre developed during convalescence from acute articular rheumatism, and in which fatal asystole occurred in less than three months. He states further that in the majority of cases fatal asystole in exophthalmic goitre is the result of an aggravation by the disease of a preëxisting cardiac lesion. In another group the heart may be apparently sound, and the asystole be due to chronic nephritis, pleurisy, or compression in the mediastinum. In a third group the tachycardia seems to be the only factor explaining the asystole. In these cases the course is generally rapid, progressive without remissions, and the asystole develops only a few weeks after the first symptoms of the exophthalmic goitre. In many cases some infection will be found to explain the thyroid lesion which gave rise to the exophthalmic goitre, and also the heart lesion which brought on the asystole. The most frequent cause is acute rheumatism, and the heart lesion usually consists of a fresh inflammatory process in the endocardium or myocardium primary or developing on old lesions.

An interesting complication of this disease has been reported by Stockton and Wochnert.[5] The case was one of rapid progression, with the usual symptoms and signs of exophthalmic goitre, but during the last

[1] Wiener klin. Woch., June 11, 1908. [2] Medizin. Klinik, April 5, 1908.
[3] Gazetta degli Ospedali e delle Cliniche, August 2, 1908.
[4] Semaine Médicale, July 8, 1908.
[5] New York Medical Journal, July 25, 1908.

three months signs developed of *thrombosis* of the right innominate vein extending to the superior vena cava, with almost complete thrombosis of the left innominate. The condition began with increased temperature, so an infection may have been the etiological factor.

Clunet[1] reports the case of a woman, aged fifty-five years, with mitral insufficiency, who had presented the symptoms of exophthalmic goitre for six months. Treatment seemed to be of no avail, and she died of pulmonary edema. At autopsy there was found an atypical epithelioma in the thyroid accompanied with the remains of colloid and fibrous goitre. The parathyroid and suprarenal glands and hypophysis were hypertrophied, it was thought, in response to intoxication and not in the way of vicarious change. The valvular lesion, previously well compensated, began to cause disturbances almost simultaneously with the development of the cancer. The case suggests that exophthalmic goitre is due more to perverted than to abnormally excessive functioning of the thyroid. Heineck[2] describes two forms of exophthalmic goitre, a primary form, in which the goitre and symptoms develop simultaneously, and a secondary form, in which the enlargement of the thyroid precedes by some interval the symptom complex.

I have frequently seen[3] cases of slight enlargement of the thyroid gland, with mild or even fairly well-marked symptoms of hyperthyroidism, associated with anemia, especially of the chlorotic type, with circulatory disorders, as in mitral disease, with venous congestion, and with nervous conditions and diseases. In most of these, two types of cases may be made out: one group in which cardiac irregularity and rapidity, tremors, sweating, and even fulness of the eyes may be present; and the other, in which definite symptoms of hyperthyroidism appear. The occurrence of such cases as these may explain, in a measure, why physicians are so at variance as to the results of treatment in this condition.

In differentiating, then, between the true exophthalmic goitre and the milder types of hyperthyroidism, the conditions referred to above should be considered; and also the character of the enlargement of the gland and the severity of the symptoms should be determined. It is to be remembered, however, that true Graves' disease may have its origin in some of these conditions alluded to, which have been allowed to remain uncorrected. Of the symptoms of Graves' disease less commonly discussed— the presence of a lymphocytosis, the enlargement of the glands of the neck, enlargement of the thymus gland, and the general condition of muscular adynamia and gastro-intestinal symptoms— none are to be much relied upon, except possibly the last two, which at times occupy important positions in the diagnosis. Three important types of cases are met with: (1) Cases of moderate enlargement of the thyroid

[1] Archives des Maladies du Cœur, April 1, 1908.

[2] Illinois Medical Journal, February, 1908.

[3] New York Medical Journal, September 26, 1908.

gland, similar to those already mentioned, which usually get well; (2) typical cases of hyperthyroidism, associated with fixed organic changes in the thyroid gland, which may or may not get well under medical or surgical treatment; and (3) cases of long standing goitre or other thyroidal disease, in which symptoms of Graves' disease supervene. Such cases belong to the domain of surgery.

Treatment of Exophthalmic Goitre. Interest in the treatment of exophthalmic goitre has been divided between the use of serum and milk of thyroidectomized animals, the Röntgen rays, and general medical treatment. Each of the methods has held the foreground for varying periods of time; and all, in the end, have been more or less disappointing in their results. Not until we have a clearer idea of the physiology of the thyroid gland and its secretions can we hope to arrive at a treatment that will really be specific and definite.

Edmunds[1] offers the following objections to the use of the blood of thyroidless animals in the treatment of goitre:

1. The severity of the symptoms is not always in proportion to the size of the goitre.
2. Myxedema and goitre sometimes co-exist.
3. Symptoms vary considerably after excision of the thyroid in animals. A distinction may have to be made between the secretion from the thyroid and that of the parathyroids.
4. The theory leaves out of account the possibility of any action of the central nervous system on the secretion of the glands.

Notwithstanding these objections, the author, after proving by experimentation that the milk of cats contained a beneficial substance, used the milk of thyroidectomized goats in three cases with beneficial results.

Von Strümpell[2] has never witnessed any objective benefit from the serum of thyroidectomized sheep, though the patients often were subjectively much benefited by it.

Eulenberg[3] has given the same variety of serum in 17 cases, and never observed any important or permanent effect, nor any ill effects. Even at the best, there was but very slight reduction in the size of the goitre, and only a transient improvement of the cardiovascular symptoms. Eichhorst[4] has noted no change after the same treatment. Cantien[5] records a case in which a cure followed rest, tonics, electricity, and the use of the milk of thyroidectomized goats. He operated on the animals himself, not trusting to commercial preparations. The patient was a woman, aged thirty years, who had resisted all other methods of treatment.

Various forms of electrical treatment have been tried, with fairly good

[1] Lancet, January 25, 1908.
[2] Medizin. Klinik, January 12, 1905.
[3] Loc. cit.
[4] Loc. cit.
[5] Gazetta degli Ospedali e delle Cliniche, May 24, 1908.

results. Pfahler[1] states that in 51 cases of exophthalmic goitre recorded in the literature as being treated with the *Röntgen rays*, 42 were followed by good results. Improvement was noted in some instances within forty hours, and almost without exception within a month. There was complete recovery, in most cases, in from three to six months. Decided improvement may be expected in about 75 per cent. of cases. If the treatment is properly given, there appears to be no danger.

Schwarz[2] reports 40 cases of exophthalmic goitre in which treatment by the Röntgen rays was used. The rays were applied to the thyroid from different sides, being filtered through leather, window glass, or tin foil. Nervous, and especially cardiac, symptoms were promptly improved. Exophthalmos was improved in fifteen patients; the goitre became larger in eight. Twenty-six gained weight, and thirty-six had a lowered pulse rate; while the nervous system was much benefited in all. One patient gained forty-eight pounds, with no change of diet.

Cook[3] discusses the treatment of exophthalmic goitre by means of the *x*-ray and *high frequency currents*. He reports his results with five cases, and states: "In every case where regular and continued treatment was given a positive cure was effected." The high frequency current acts by its nerve-sedative action, causing a restoration of the normal equilibrium of disturbed metabolism; and by its local action, stimulating the cellular activity of the thyroid gland, acting, probably, through an increase in its blood supply. The *x*-rays are so employed that only the stimulating action is utilized. On the goitre itself, there is first a contraction of the organ, followed by an enlargement; and this, in turn, is followed by contraction. These reactions continue throughout the course of treatment. On the tachycardia there is, during the exposure, a disturbance of rhythm, with intermittence, followed by a gradual slowing of the pulse, reaching its maximum in ten minutes. These changes occur in other conditions than exophthalmic goitre, and are explained as being due to an indirect stimulation of the vagus nerve. The effect of the rays on the nervous system is decidedly sedative in the majority of cases, inducing mental relaxation and a strong tendency to sleep. In some cases there was a nervous reaction, accompanied by restlessness, mental excitement, and peculiar sensations in the head; but even here there followed the relaxation and desire to sleep.

Thomson[4] objects to the theory of hypersecretion as explaining all the symptoms of exophthalmic goitre. He believes that some disturbance of metabolism, especially of the nitrogenous elements of the food, is at the basis of the etiology of the disease. He acknowledges that while beneficial and sometimes curative effects often follow the use of

[1] New York Medical Journal, October 24, 1908.

[2] Wien. klin. Woch., September 17, 1908.

[3] Journal of the American Medical Association, March 7, 1908.

[4] American Journal of the Medical Sciences, March, 1908.

the serum, as suggested by Rogers and Beebe, the explanation of its action is "quite another matter." His final verdict is that proper dietetic and medicinal treatment furnish the best chances for recovery in both mild and severe cases. He looks upon uncontrollable vomiting and diarrhea in an advanced case as conditions offering little hope.

He advises rest from muscular exercise, a diet in which the nitrogenous foods have been largely substituted by vegetables, milk fermented or peptonized, but never raw, and fruit, except uncooked apples or strawberries. Intestinal antiseptics are to be given continuously, and a mercurial twice weekly.

Von Strümpell also lays great stress on the regulation of the diet; complete mental and physical rest, fresh air, artificially carbonated baths, and electricity are all valuable adjuncts. He gives iron and arsenic in anemia and emaciation; bromides in case of much nervousness; valerian, or exceptionally digitalis, when the heart disturbances become troublesome. He recommends operative procedures only after the failure of all other methods.

In regard to living at *high altitudes*, Stiller[1] reiterates his opinion, first expressed in 1888, that a sojourn in the mountains is an important factor in the treatment of functional nervous affections in general, and especially in exophthalmic goitre. He reports two cases in which complete recovery followed repeated visits to the mountains at an elevation of 2000 to 4000 feet. The stay in the mountains must be of several months' duration, and it is usually necessary to return for several years in succession to render the cure permanent. Better results seem to be obtained in the cases with dropsy than in the well-compensated chronic cases. The heart affection in such cases seems to have its origin in a neuropathic condition, and thus stands on another basis than do the organic heart affections.

Erb[2] likewise advocates living at altitudes of 2300 to 5400 feet as a remedial measure of great importance.

Weber[3] reports three cases in which a practical cure was brought about by the administration of *arsenic*, gr. $\frac{1}{60}$, combined with an equal amount of *mercury perchloride*, taken three times a day. The treatment lasted about three years, and complete recovery has now continued for two more. Bernhardt[4] emphasizes the neuropathic inheritance possessed by the majority of exophthalmic goitre patients, suggesting prophylactic measures. Fulton[5] considers as the principal measures of treatment, rest, balneotherapy, and dieting, with the systematic use of drugs.

Jackson and Meade[6] recommend the use of the *neutral hydrobromate of quinine*, given in five-grain capsules three times a day. They insist

[1] Medizin. Klinik, March 1, 1908.
[2] Ibid., January 5, 1908.
[3] Medical Record, February 8, 1908.
[4] Deut. med. Woch., July 2, 1908.
[5] California State Medical Journal, June, 1908.
[6] Boston Medical and Surgical Journal, March 12, 1908.

that the neutral salt be used, as better results are obtained than with the acid salt. They have treated 85 cases with this drug. Of 56 cases that could be followed for a number of years, 42 were cured (no signs or symptoms for two years), or 76 per cent.; 7 cases were benefited (signs or symptoms recurring within two years), or 13 per cent.; 6 cases showed no improvement, or 11 per cent. In addition to hydrobromate of quinine, other general measures were used, such as rest, diet, and care of the stomach, intestines, and skin.

Lancereaux[1] looks upon the active vasodilatation, primary or reflex, of the vessels of the head and neck as the cause of the enlargement and excessive functioning of the thyroid, causing cerebral symptoms, tachycardia, tremor, and emaciation, and, therefore, recommends quinine for its marked vasoconstrictive action on the vessels. He administers it in doses of 15 or 22.5 grains, at the evening meal, divided into three capsules taken at fifteen-minute intervals. He keeps this up for twenty days each month, with a suspension for ten days. He sometimes supplements the action of the quinine with ergot, giving from 1.5 to 7.5 grains daily in the morning. A clinical cure has been the rule in all his 21 patients treated with this method since 1898.

For three years Berbey[2] has used an alcoholic solution of *lecithin*, with excellent results in many cases of asthma, and has now tried it in a few cases of exophthalmic goitre, with quite favorable effect. It is given in combination with a milk diet, and only when the digestion is unimpaired. He discusses the histories of four cases—two of severe type—in which the treatment proved beneficial. There results, shortly after taking, a "quieting" of the nerves and a cessation of the acute symptoms.

Fabre and Thévenot,[3] in a discussion on *goitre in the newborn*, state that treatment should begin with the mother, where there is an inherited tendency existing. This includes good general hygiene, iodides, etc., during pregnancy. The newly born baby should have medical treatment; and if this does not relieve the difficulty, the surgeon should be summoned.

Mayo[4] states that goitres in the young seldom require treatment. He prefers some form of iodine externally, causing intermittent irritation of the gland. If medical treatment proves unavailing, they resort to surgical measures.

Myxedema. Under the title of "Incomplete Myxedema, or Hypothyroidea," Elliot[5] describes a form of myxedema that is coming into more general notice. The early signs of the disease are often overlooked. The symptoms, in general, are the same as those of fully developed myxedema, only less intense and atypically grouped; they also disappear

[1] Bull. de l'Acad. de Méd., February 25, 1908.

[2] Bulletin of the Johns Hopkins Hospital, September, 1898.

[3] Revue de Chir., June 10, 1908. [4] Southern Medical Journal, July, 1908.

[5] Journal of the American Medical Association, May 30, 1908.

on thyroid feeding. Elliot objects to the name of myxedema for the disease under discussion, on the ground that it refers merely to a symptom. He suggests the term "chronic atrophic thyroiditis," as in the majority of cases there is a definite cirrhosis of the gland, resulting in more or less complete destruction of its secretory structure. In some cases there may be enlargement of the gland, with a colloid degeneration of the secretory cells. The fully developed form of myxedema is comparatively rare in America; but, according to Elliot, the milder forms are more or less frequent.

Hypothyroidea is seen most frequently in women, at or near the climacteric. This is possibly due to the previous hyperfunction and irritation of the thyroid during pregnancy and lactation. Often a history of distinct hypothyroidea occurring earlier in life may be obtained, so that the partial loss of function may be looked upon as a secondary atrophy.

Among the most frequent symptoms are indications of impaired nutrition, such as transient edemas, bagging of the eyelids similar to what is found in nephritis, a dry and scaly condition of the skin, thin hair, joint pains and aches, neuralgias, paresthesias, susceptibility to cold, etc. The skin may show a slight yellow tinging. There is a distinct tendency to obesity, with marked diminution in strength and vigor. Loss of mental power and visual and aural acuity are common. Thyroid extract is advised in the way of treatment.

Herz[1] reports an interesting case of acquired myxedema in a man, aged forty-five years, who showed symptoms of tetany. The blood serum showed a mydriatic action. The assimilation limit for grape sugar was raised, suggesting an antagonism between the thyroid and the pancreas. Improvement followed the administration of thyroid preparations. The *blood findings* in cases of myxedema are given by Bence and Engel[2] as consisting of a leukopenia with a relative lymphocytosis and eosinophilia. The lymphocytosis is probably based on a lymphoid change of the bone marrow, while the eosinophilia could be explained by the presence of a chemotactively positive substance in the blood.

GOUT.

Etiology of Gout. Osborne[3] defines gout as a "non-infectious, aseptic disease, due to a disturbance of the transformation of the protein food molecules, more especially the purin molecules, to the excretion end products." The causes, therefore, of the disease are many. Of the predisposing causes, heredity is given first place. Others are middle age, sedentary habits, alcohol, overeating of rich food, prolonged mental

[1] Wien. med. Woch., 1908, No. 38.
[2] Ibid., No. 25.
[3] Monthly Cyclopedia and Medical Bulletin, August, 1908.

depression or worry, and such infections as leave lesions of the organs engaged in nitrogenous metabolism. The direct attack may be started by the eating of varying quantities of proteins containing purin bases (nucleoproteids).

Bradley[1] emphasizes the hereditary tendency of gout. He says that there seems to be no doubt that gout can be and is transmitted from generation to generation, as a well-defined inclination toward the malady at a time when the individual has reached the period of maturity, quiet, and general prosperity. It is not transmitted in its acute form; for gouty symptoms are almost unknown before the age of puberty, and are rare before maturity is attained. The disease represents an example in which acquired characteristics can be handed on to the next generation, a fact not true of many other diseases.

The condition must, therefore, concern itself with the fundamental elements of physiological processes, and strike at the very roots of metabolic changes. He also brings out the fact that in different individuals the total of the purin metabolism will be different; though in the same person, under normal conditions, there is a rather constant nuclear metabolism, resulting in the excretion of a fairly consistent amount of uric acid in the urine. It seems clear, therefore, that any abnormal change in the relative or total amount of these enzymes, or a change in the permeability of the kidneys, as in nephritis, will make a change in the amount of uric acid produced, destroyed, and excreted in a given time. The treatment is, therefore, beyond the reach of specific drugs.

Silvestri[2] believes that the disturbed metabolism of nuclein is the result of perverted function of the lymph-producing organs, which may be congenital.

Gout is to be distinguished from acute articular rheumatism by its special site and by the greater participation of the soft parts in the inflammatory process. The urates are deposited where the circulation is most sluggish, and so attack the smaller, remote joints. The big toe has the most weight to bear, and, besides, it is farther from the heart than the other joints. Both factors favor the deposition of urates.

Möller[3] accepts two forms of gout—"metabolism gout" and "kidney gout." The essential element is the constant presence of uric acid in the venous blood, even on a purin-free diet. No uric acid is found in the blood in health, because what is formed is at once destroyed by the uricolytic ferments. He, therefore, suggests that gout is the result of some disturbance in the action of this ferment.

G. Falkenstein[4] suggests that gout is the result of an inherited insufficiency of the gastric glands of the fundus. This he bases on the defi-

[1] Wisconsin Medical Journal, July, 1908.

[2] Gazetta degli Ospedali e delle Cliniche, May 1, 1908.

[3] Therapeutische Monatshefte, May, 1908.

[4] Berliner klin. Woch., vol. xliv, No. 48.

ciency of hydrochloric acid in the stomachs of those with gout, and on Silbergleit's statement that in a long number of experiments on animals the formation of urates in artificially induced foci of gout was prevented by the administration of hydrochloric acid, while under alkalies, the urates were as regularly deposited. He believes the deficiency of hydrochloric acid is primary in gout, while it is secondary in all other conditions.

Von Jaksch[1] reports the case of a man, aged forty-five years, who developed gout with secondary enlargement of the spleen and leukopenia. There was nothing to suggest leukopenia, nor was anything abnormal found in the gouty joints.

Treatment of Gout. Under the title of "Modern Treatment of Gout," Amblard[2] has outlined a course of treatment based on the results of recent research. It has been pretty well demonstrated that uric acid is derived from the xanthin bases, that both these and thymic acid are derived from nucleic acid, and that normally the thymic acid keeps the uric acid in solution. He recommends a diet with a low percentage of purin, quoting in this connection Hall's tables of the amount of purin in the different articles of food. These show that white meat contains as much, or nearly as much, purin as dark meat, and that beans and oatmeal also contain large amounts. Inasmuch as high temperature breaks up the combination of thymic acid and the purin bases, meat, too well cooked is less desirable than rare meat. He allows milk, butter, and fresh cheese, eggs, and a little red meat once a day. Among drugs, he advises the salicylates and the alkalies. Courses of mineral water are especially useful, not only for the gouty, but for their children, as a preventive measure. He suggests that many disturbances formerly attributed to gout are, in reality, due to latent arteriosclerosis and uremia. He concludes with the warning that excessively strict directions may cause the patient to follow them to an exaggerated degree or to disregard them altogether.

Sikes[3] recommends a simple mixed diet for the average case—one modified to suit the individual digestion, rather than one free from this or that particular variety of food. The tendency seems to be growing to consider carbohydrates and their effect on the liver as of special importance. It is, therefore, advisable to reduce the amount of carbohydrates taken in pure form. Measures should be taken to keep the gastric juice as concentrated as possible, so that liquids with the meals should be restricted. In the average patient, meat need not be forbidden, but the amount should be kept low. Simple meals, elimination of carbohydrates, restriction of alcohol, and the drinking of non-alcoholic liquids between meals include the important factors.

On the ground that the disease is due to a decreased functional activity of the cells of the body, on which fermentative uricolysis depends, Wein-

[1] Deut. med. Wochensch., April 9, 1908. [2] Arch. générales de Méd., July, 1908.
[3] Practitioner, 1908, vol. lxxx, p. 3.

traud[1] advises physical methods to increase their activity. Following the *regime* used at Weisbaden, he recommends warm or hot baths, 95° to 104°, with a percentage of salt isotonic with the blood; the drinking of fairly large quantities of mineral waters; walks with easy grades; and sometimes exercises in the patient's room. The treatment is to be continued for four to five weeks.

Falkenstein[2] recommends the use of hydrochloric acid in rather large doses, to overcome the subacidity of the stomach and to prevent the formation of urates in foci. The acid is not able to arrest an attack of gout; it merely corrects a tendency to the disease, and so must be taken continuously. In his experience with 390 gouty patients, the best results were obtained in those in whom the disease was comparatively recent. In the old chronic cases the general health was improved, the course of the disease was arrested, the pains were relieved, and the danger of involvement of the internal organs was averted. Möller[3] also emphasizes the use of hydrochloric acid and the avoidance of a purely vegetable diet, for fear of an excess of alkalies from the vegetables. During the acute attack, colchicum, local heat, etc., are indicated; but small amounts of hydrochloric acid should be taken all the time. The diet should be purin-free, to avoid precipitating an acute attack. Becker[4] recommends colchicum as the main drug in the treatment of the acute attack, given until diarrhea results. It may also be given three times daily, in small doses, as a prophylactic measure. Hirsch[5] recommends the Bier hyperemia treatment and hydrotherapy, among other measures, in the treatment of gout.

DIABETES MELLITUS.

Probably no subject in medicine has so held the attention of clinicians and so persistently monopolized the zeal of investigators as have glycosuria and diabetes mellitus, in all their varied phases. The already voluminous literature along these lines, which has grown up since the remarkable announcement of Claude Bernard's glycogenic theory in 1848, has been reinforced during the past year by the usual full quota of contributions. A survey of these recent additions to the literature on diabetes makes it evident that today interest centres chiefly about the experimental and physiological aspects of the subject, rather than the purely clinical. Since it is obvious that only by arriving at a more intelligent understanding of carbohydrate metabolism can we hope to cope successfully with the fundamental perversion of metabolism which exists in connection with diabetes.

[1] Practitioner, July, 1908.
[2] Berliner klin. Woch., vol. xliv, No. 48.
[3] Therap. Monatsh., May, 1908.
[4] Deut. med. Woch., February 20, 1908.
[5] Medizin. Klinik, August 9, 1908.

Clinical Pathology of Diabetes. CARBOHYDRATE METABOLISM. The present status of diabetes mellitus in relation to our knowledge of carbohydrate metabolism has been critically dealt with by F. W. Pavy in a series of comprehensive lectures delivered before the Royal College of Physicians of London.[1] He begins by vigorously assailing the glycogenic theory, especially that part of it which teaches that the carbohydrates of the food are conveyed through the blood, in the form of free sugar, to the tissues; and that, under normal conditions, this sugar fails to appear in the urine, because the kidneys are impermeable to it. He maintains that this cannot be true, because sugar appears in the urine in direct proportion to the amount that is present in the blood. This is an established fact, based upon positive evidence that "normal urine contains sugar." The amount of sugar normally present in the urine is exceedingly small, and has been generally overlooked, because it fails to give a positive reaction with Fehling's solution. It has, however, been discovered by other methods.

Pavy estimates that ordinarily sugar is present in the blood in the proportion of about 1 to 1000; and that, since sugar, like saline, is one of the small molecular bodies that pair off from the blood circulating through the kidneys with the water of the urine, a certain proportion of the sugar content of the blood must appear in the urine. Experimentally, when four grams per kilogram of dextrin were injected intravenously into an animal within one and one-half minutes, 47 per 1000 of sugar appeared in the urine. This will hold for the smallest quantities, as well as for the large; and he emphasizes the fact that the urine invariably indicates the amount of free sugar present in the circulation. The glycogenic theory, therefore, is untenable; since, if the ingested carbohydrates were being constantly carried about in the blood as free sugar, this substance would always be demonstrable in the urine; whereas, we know that in health 200 to 300 grams or more of sugar may be taken into the stomach without any demonstrable alteration occurring in the state of the blood and urine. In diabetes the opposite condition prevails; the ingested carbohydrate, acting the same as if it were directly introduced intravenously, promptly appears in both blood and urine. He points out the well-recognized fact that many diabetics can take carbohydrates up to a certain point without any apparent alteration in the urine. This toleration point varies within wide limits; but he believes that in each individual the boundary line is definitely fixed and is maintained with remarkable constancy. The amount of sugar that appears in the urine is proportionate to the amount of carbohydrate ingested over and above the toleration point. This phenomenon he interprets to mean that, up to a definite point, carbohydrates can be assimilated without increasing the amount of sugar present in the blood; while if taken beyond this limit,

[1] Lancet, November 21 and 28, and December 12, 1908.

the amount of sugar in the blood is increased just as is the case with the urine.

At the very foundation of the glycogenic theory rests the belief in the sugar-producing property of the liver. This was based upon the various experiments in which blood was taken from the portal and hepatic veins of a dead animal; upon being tested, the portal blood failed to reduce copper, while with the blood of the hepatic vein a reduction occurred. This was taken to mean that sugar was elaborated in the liver; hence was contained in greater amounts in the efferent than in the afferent vein. Pavy discredits this observation upon his own experimental evidence. After catheterizing the portal and hepatic veins during life, he was able to demonstrate no difference between the behavior of these two varieties of venous blood when tested side by side.

By the adherents of the glycogenic doctrine, the liver has also been regarded as of prime importance, as the one agency by which the sugar of the food was hindered from reaching the blood in quantities large enough to cause glycosuria; yet, as Pavy points out, the liver may be completely cut out of the portal circulation by means of the so-called Eché fistula (the anastomosis of the portal vein into the inferior vena cava, and ligation of the portal vein above this union), without the appearance of sugar in the urine. This confirms this view of the subsidiary role played by the liver in checking the entrance of sugar into the circulation. He regards the liver as "a second line of defence," acting upon sugar only when such large amounts are ingested that all cannot be dealt with at the site of primary absorption, which he believes to be the intestines.

Inasmuch as the author so vigorously combats the teaching of Bernard, it is of interest to note the theories that he advocates in their stead. He maintains that, in order to explain conditions as we actually find them, we must conclude that when carbohydrates are ingested and broken up, preparatory to being taken up by the circulation, the onward progress of the resulting sugar is arrested in the intestinal mucosa. Therefore, the disappearance of sugar occurs at the seat of absorption.

Such a conception of this process, he argues, is entirely reasonable; since, in the first place, "as can be shown by the effects of cleavage agencies, carbohydrate can be cleaved off from its locked-up state in protein;" and, further, "that carbohydrate can, in the presence of nitrogenous matter, be built up into protein by the instrumentality of the synthetic power inherently belonging to bioplasm." Now, nowhere do we find such activity of protein formation existing as at the seat of intestinal absorption. Quiescence prevails at a period of fasting; but after food ingestion, extremely active bioplasmic growth starts into operation. The newly formed bioplasm flows, in the shape of lymphocytes, through the chyliferous vessels into the circulatory system, and gives rise to digestion lymphocytosis, which is observed to follow the ingestion of food.

The intestinal lymphocytes, then, constitute the source of bioplasmic activity, supported by absorption of the products of digestion, and depending upon the existence of a complex bioplasmic molecule. Such a complex molecule is conceived to exist as a nucleus, surrounded by many arms or "side chains," provided with an innumerable variety of endings. These endings can combine with other manners of molecules, provided they have the appropriate complementary side-chain endings. These side-chain groups may, however, be split off as occasions arise, without detriment to the nuclear centre. Not only carbohydrates, but also fat, suitably hydrolyzed, and oxygen become linked on to the bioplasmic molecular complex, within which "the metabolic action at the foundation of life occurs."

In accordance with this view, as the result of bioplasmic activity, the sugar molecules are disposed of by synthesis into complex protein molecules, which are conveyed through the circulation within the lymphocytes. Thus, locked-up within the protein of the blood, sugar may be conveyed from the seat of absorption without running off into the urine, as would be the case did it exist in the circulating blood as free sugar.

The next step for which Pavy believes there is ample evidence is the autolysis of the lymphocytes. By this means the protein molecule becomes a part of the protein elements of chyle and blood plasma, and is brought into easy reach of the various tissues.

The manner in which the sugar, locked up in these large, complex protein molecules of the blood, from which the tissues draw their pabulum, is ultimately utilized by the fixed cells of the body is largely a matter of speculation. Concerning the application of Ehrlich's side-chain theory to the fundamental metabolic processes of the body, it seems probable that cells are provided with side chains, or tentacles, possessing not only endings capable of attaching the protein molecules, but also endings that take up a suitable ferment from the blood. This enzyme, acting as a complement, splits off from the complex molecule the particular side chain needed (as, for example, the sugar); and, further, by interaction with the tissue cell, enables it to assimilate this portion separated from the protein molecule.

Where large amounts of carbohydrate are ingested, a certain proportion fails to be disposed of at the seat of absorption. This excess, Pavy believes, is conveyed as sugar through the portal blood to the liver, where it is prevented from entering the systemic circulation by being stored in the liver as glycogen. The synthesis of the sugar molecule into glycogen is accomplished through the agency of an intracellular enzyme. The glycogen of the liver, therefore, represents a carbohydrate reserve obtained from the food, and corresponds to the amount of sugar that happens to be reaching the liver through the portal blood. The object of this store of reserve is to have carbohydrate ready for use when required for bioplasmic growth and energy production. Energy is mainly

produced in the muscles, where the amount of reserve depends largely upon the rate of usage.

In order for glycogen to be utilized, it is broken down into sugar by enzyme action. As the seat of utilization is often far removed from the liver, this sugar must be conveyed through the blood. If the sugar enters the blood stream as sugar in a small molecular state, its presence will be demonstrable in the urine, which, ordinarily, is not the case. It seems evident, therefore, to this author that the sugar resulting from the glycogenic breakdown becomes attached to the protein molecules as side chains, and is conveyed in this large molecular combined state through the circulation to the tissues, which split off the requisite sugar from these molecules, without causing their destruction.

As Pavy puts it, the question is largely one of "the strength of affinity." When the sugar linked to the protein molecule of the blood reaches the tissues in want of carbohydrate, a stronger affinity exists between the sugar and tissue molecule than exists between the sugar and the carrying molecule. Hence the sugar passes to the tissue. This loss of sugar from the complex blood molecule creates unsatisfied side chains, which, in turn, draw upon the glycogen store. Glycogen being more transportable as such, becomes broken down into sugar by enzymes, in order to combine with the empty side chain. The whole process is comparable to the phenomena that occur during the transport of oxygen from the lungs to the tissues by the hemoglobin.

In addition to what has been said of Pavy's conception of carbohydrate metabolism, it is worth while mentioning his view of the role played by the pancreas in connection with this process. In immunity nomenclature, an intermediary body by means of which another body—as, for example, a lysin—is brought into union with the bioplasmic molecule is called an amboceptor. An amboceptor appears to be analogous to the co-ferments that are said to be essential to enzyme action. Now, from careful reasoning, based upon a large series of experiments, he has come to the conclusion that an amboceptor action is concerned in linking the food molecules to bioplasm. The amboceptors concerned in the union of sugar molecules to the bioplasmic molecules, he suggests, are derived from the pancreas. Further, by analogy, he reasons that if such amboceptors are operative in the production of the complex bioplasmic molecule, they may also be assumed to be necessary for the conversion of sugar into glycogen in the liver.

If this reasoning in regard to the pancreas be correct, it offers an explanation of the occurrence of glycosuria after extirpation of the pancreas and in widespread pancreatic lesions; for if, for any reason, the amboceptors supplied by the pancreas are wanting, the proper arrest of carbohydrates at the seat of absorption will fail to occur, and sugar, having entered the blood in a free state, will manifest itself in the urine.

In connection with the work of Pavy, it is interesting to note that

Schlesinger[1] has come to the conclusion, as the result of experiments, that the diastatic ferment of the blood must, in the main, be derived from the pancreas. He found that, three days after ligating the duct of Wirsung, there occurred an increase in the diastatic ferment in the blood, with, later, the appearance of diabetes. On the other hand, in both the dog and the cat, after complete extirpation of the pancreas, there was noted a diminution of the diastatic power of the blood to one-third the normal, although the amount of the sugar output and the strength of the diastatic power in the blood serum were not parallel to each other.

Among other workers in the field of carbohydrate metabolism may be mentioned Falta, who has been contributing a notable series of papers on the elimination of sugar in diabetes mellitus. He reports a case of diabetes[2] in which, during the time the body weight remained constant, an enormous retention of nitrogen occurred. This retention became noticeable as soon as the proteid supply sank below a certain amount. Furthermore, this case was more sensitive to proteid than to carbohydrate.

In another paper, Falta and Gigon[3] conclude that in severe diabetes mellitus the lessening of the proteid elimination is not only not quicker, but in one case it was actually slower, than is found in normal individuals. They believe that it is only the cases of genuine human diabetes that behave toward fats in a way diametrically opposite to this. Finally, they maintain that in a certain group of cases which are on a rigid diabetic diet the elimination of sugar is governed alone by the proteid metabolism, whereas in other groups of cases there also exists variation in the fat metabolism.

Diabetic Lipemia has been made the subject of careful investigation by Klemperer and Umber.[4] In their earlier work they showed that diabetic lipemia was in truth a lipoidemia, with both lecithin and cholesterin present in the blood serum. They have now found that the explanation of this fat transportation which they previously offered is not sufficient, and at present they are at a loss to determine the cause of the lipoidemia. They can refute the claim that a fat-destroying ferment exists in the blood; therefore, the presence of such a substance in diabetes cannot be made answerable for the lipoidemia. Moreover, they can show that the lipoid substance originates neither from the brain nor from the kidney. They have, however, been able to demonstrate, from observations carried out on ten additional cases of diabetes, that in lipemia acidosis is always present, whereas acidosis may exist without the occurrence of lipemia.

[1] Deut. med. Woch., vol. xxxiv, No. 14.
[2] Zeitsch. f. klin. Med., vol. lxv, No. 3.
[3] Ibid., No. 4.
[4] Ibid., Nos. 3 and 4.

Diabetic Acidosis. Last year, unfortunately too late to be incorporated in our last contribution to PROGRESSIVE MEDICINE on diabetes, there appeared, by Goodman, a complete review of the recent advances that had been made in our knowledge of diabetic acidosis.[1] His article entirely analyzed all the important conclusions on this subject that had been published since 1900. From this careful study, Goodman was led to conclude that the symptoms of acidosis and coma are due simply to "an increase of acid in the organism," a condition which in diabetes is caused by β-oxybutyric, but which could be caused by sulphuric or any other acid. The acid acts by withdrawing from the body its supply of alkali, thus producing acidosis. He regards it as settled that the chief source of acetone bodies (β-oxybutyric acid, diatetic acid, and acetone) is fat-containing fatty acids; but that it has also been proved that, under certain conditions, they may be derived from proteid. Although some have supported the intestinal origin of acetone bodies, Goodman believes that the weight of evidence points to the liver as the probable source of these substances.

Baer[2] also has reported upon the newer investigations concerning the origin of the acidosis in diabetes. He maintains that at present we are not in possession of any positive evidence to show that diabetics can form oxybutyric acid from grape sugar, but that a strong likelihood exists that this acid is derived from the fatty acids. Furthermore, he regards the proteid bodies as rich in material from which oxybutyric acid may arise. However this may be, he considers it as definitely proved by the researches of Magnus-Levy that the acidosis bodies in diabetic coma are derived from various substances.

In those suffering from diabetes, according to this author, the acidosis causes injury in a twofold manner: First, because of the loss of substances which would be used as nutritive material were they not eliminated in the acidosis bodies unutilized; and secondly, because of the marked overproduction of acid material which cannot be oxidized. He points out that just so long as the amount of ammonia elaborated is sufficient to neutralize the acid present, no harm results, and the acid bodies are eliminated in the urine as various acid compounds. When, for any reason, however, the quantity of acid present becomes so great that it is no longer capable of being neutralized by the ammonia, a considerable amount of oxybutyric acid is found in the blood and organs. Such an event is manifested clinically by the occurrence of the symptom complex known as diabetic coma.

As a result of his experimental observations, Baer makes some comments on the therapeutics of coma in diabetes. From our knowledge of acidosis, the most reasonable procedure seems to be to try to check the great loss of alkali from the tissue by neutralizing the acids present with large doses of alkalies. When the urine has been rendered alkaline,

[1] Archives of Internal Medicine, May, 1908. [2] Therap. Monatsh., June, 1908.

it is presumptive evidence that this neutralization has been accomplished. It is his experience that this result is never achieved in the fatal cases of coma, although large repeated doses of sodium bicarbonate, continued over a number of days, have often been the means of checking a complete diabetic coma in children.

It has been found that in dogs suffering from well-marked phloridzin diabetes the acidosis may be lessened by injections of sodium glutate. With this in mind, Baer tried such injections on patients; the results were by no means uniform, although in a few cases they did good.

From time to time it has been pointed out that an estimation of the quantity of *ammonia present in the urine of diabetics* is an excellent index of the degree of acidosis present. Goodall and Joselin[1] have taken up this matter anew. They point out that since the introduction of Folin's simplified method for the determination of ammonia in the urine, this is no longer the time-consuming process it formerly was, and is now practicable from a clinical standpoint. The ordinary determination of acetone and diabetic acid as an indication of fatal acidosis they regard as unreliable; while the determination of the carbohydrate balance, excellent as it is when accurately carried out, they consider inferior to the estimation of ammonia for this purpose, because of the error it is subject to unless the patient is rigidly controlled.

After a painstaking, careful research they come to the following conclusions as to the clinical value of estimating ammonia in diabetes:

1. Quantities of ammonia reaching 5 grams in twenty-four hours indicate an extremely severe form of diabetes, which usually proves fatal within a year.

2. Patients under forty years of age tolerate an acidosis estimated in terms of 4 to 5 grams ammonia far better than those above fifty years tolerate an acidosis of 2.5 to 4 grams ammonia. An acidosis in an individual above fifty years of age is of very serious prognostic import.

3. A knowledge of the ammonia excretion usually helps in the treatment of a case of diabetes, and generally, but not always, gives warning of impending danger.

4. The value of a knowledge of the ammonia excretion in the prognosis of a diabetic patient is enhanced by a knowledge of the quantity of the albumin and carbohydrates in the diet.

5. A lowering of the carbohydrate intake, in a severe case of diabetes, from a total of 80 grams to 55 grams in twenty-four hours produces little effect upon the acidosis.

Arany[2] suggests that the acids which are found in the blood of diabetes, which, when they appear, injure the assimilative power of the organism, especially for carbohydrates, may be the result of some toxin elaborated by an as yet undiscovered microörganism. This hypothetical micro-

[1] Boston Medical and Surgical Journal, May 7, 1908.

[2] Medical Press and Circular, February 5, 1909.

organism, he conceives, may even be present in health, and possibly is capable of causing diabetes when the environment becomes suitable.

Secretin in Diabetes. Since the discovery of secretin and its important relation to pancreatic activity, it has been suggested by some that this substance might excite, as well as an external secretion of the pancreas, some internal secretion having a bearing on diabetes. Working along these lines, certain investigators found that in some cases of diabetes prosecretin, the precursor of secretin found in the intestinal mucosa, was absent.

Sweet and Pemberton[1] have contributed some valuable observations on secretin, based upon elaborate experimental work, and state, as one of their conclusions, that "the evidence so far adduced that secretin is absent in some varieties of diabetes does not seem conclusive."

In connection with the work being done on secretin, may be mentioned the results obtained by Bosanquet,[2] who administered secretin, in the form of two fluidounces of an acid extract of duodenum, supplied by Prof. Starling, to two brothers suffering from diabetes mellitus. Both cases ultimately proved fatal, and went to autopsy; but during life it was found that the sugar in the urine was uninfluenced, whereas the acetone bodies were increased.

Adrenalin and Diabetes. Zuelzer[3] has published some interesting experimental and clinical observations on the relation that exists between sugar metabolism and adrenalin. At the same time, he showed that an antagonistic action exists between the adrenal secretion and the alleged internal secretion of the pancreas.

He found that when normal blood was allowed to circulate through the liver of a dog whose pancreas had been extirpated, the sugar in the dog's urine increased from 50 per cent. to 70 per cent., but this percentage of sugar became decidedly greater when the liver used was from a dog in whom suprarenal diabetes had been previously induced. He believes that the internal secretions from the pancreas and the adrenals react upon each other within the liver, in such a way as to maintain the normal sugar elimination. When the pancreatic secretion is wanting, as in pancreatic diabetes, the unhindered adrenalin produces an increase in the sugar. When the function of both the pancreas and the adrenals was destroyed, glycosuria failed to occur. After the pancreas was removed and the suprarenal veins were ligated, there was again an absence of diabetes. An enormous number of pancreatectomies have been performed by this observer; and, except when suprarenal veins were also tied off, glycosuria always followed. In short, Zuelzer is convinced that one of the most important functions of adrenalin is its effect on the sugar metabolism in the liver.

[1] Archives of Internal Medicine, February, 1908.

[2] Lancet, January 4, 1909. [3] Deut. med. Woch., xxxiv, August 6, 1908.

While working on a method of estimating functional insufficiency of the pancreas, in regard to both its external and its internal secretion, Lépine[1] has made some observations which have a bearing on the above-mentioned relationship that appears to exist between some of the adrenals and pancreatic secretions. It has been found that a weak adrenalin solution instilled into the eye of a pancreatectomized animal causes mydriasis. Fifty-five per cent. of the eighteen diabetics into whose eyes Lépine instilled adrenalin showed dilatation of the pupil; whereas, in thirty non-diabetic persons so tested, only two gave such a positive reaction. The inference to be drawn from this is that in over one-half of the diabetics tested there existed, in all probability, some abnormality of the internal secretion of the pancreas; hence the effect of the adrenalin was not in any way hindered.

The Etiology of Diabetes. Hypophysis Glycosuria. Out of 176 cases of *acromegaly* reported in the literature, Borchardt[2] found that glycosuria occurred in 35.5 per cent. Since the cause of acromegaly has been assigned to hypophyseal hyperactivity, this author conceived the idea that the glycosuria so frequently associated with acromegaly might be the result of the same functional perversion. He set about demonstrating this experimentally by injecting extract of hypophysis obtained from men and horses into dogs and rabbits. In the former, although after large doses of this extract glycosuria sometimes occurred, there was no uniform result obtained. In rabbits, however, a glycosuria, varying from the slightest trace of sugar to 4.2 per cent., occurred constantly. Two rabbits showed a hyperglycemia. Extract of brain, given subcutaneously, failed to cause any glycosuria. Hence, Borchardt considers that the glycosuria associated with acromegaly may possibly be due to overactivity of the hypophysis.

Cholelithiasis and Pancreatic Diabetes. The occurrence of gallstones in association with glycosuria of pancreatic origin is now well recognized. Croftan[3] has made a study of this relationship, and points out the importance of actually recognizing such cases. The sequel of events leading up to this condition varies in different cases. As he says, the gallstones may be primary to a pancreatitis resulting in glycosuria; again, chronic pancreatic lesions may produce, on the one hand, glycosuria, and, on the other, cholelithiasis; and finally, a common causal factor may simultaneously produce both the pancreatic diabetes and the biliary calculi.

The clinical picture of gallstones and pancreatic diabetes is also variable and, for that reason, frequently offers considerable diagnostic difficulty. Croftan emphasizes the fact that some cases first appear as severe, obstinate, idiopathic diabetes, in which the gallstone element

[1] Semaine Médicale, April 1, vol. xxviii.
[2] Zeitschr. f. klin. Med., 1908, vol. lxvi, p. 332.
[3] Lancet-Clinic, December 5, 1908.

is kept so in the background that it is readily overlooked. Other cases appear as cholelithiasis, with varying degrees of glycosuria, in which the underlying pancreatitis is not evident; while a most confusing group embraces those cases of pancreatic glycosuria and gallstones in which both conditions arise simultaneously, but independently of each other.

He further states that pancreatic diabetes occurs more frequently in acute than in chronic lesions of the pancreas; that it is more common at the beginning than toward the end of the pancreatic disease; and that, when there is a family history of diabetes, the mildest grades of pancreatitis are apt to give rise to a glycosuria.

O'Day[1] has also called attention to the occurrence of diabetes or, better, glycosuria in connection with cases of gallstones associated with induration of the head of the pancreas. The results of his observations, however, afford nothing conclusive.

In contradistinction to the view that the true source of diabetes lies in the tissue of the pancreas, we find the assumption that, in reality, it is chiefly the duodenal nerve plexus and the pancreatic fibers derived therefrom that are at fault in this disease. Bleibtreu[2] reports in detail two autopsies on cases of undoubted diabetes in which the pathological findings were of such a nature as to lend support to this view of the etiology of diabetes. As he points out, a theory which maintains that as long as the innervation of the pancreas and duodenum is intact diabetes does not occur is admirably calculated to explain the many cases of diabetes in which the pancreas is shown to be normal, as well as those cases in which marked pancreatic lesions exist without the occurrence of glycosuria.

Diabetes of Infective Origin. The possible role played by infections in the etiology of diabetes is by no means clear. From time to time, diabetes follows an acute infection so closely that some connection between the two conditions seems undeniable. Instances of this kind are recorded by Hirschfeld,[3] who reports several cases in which diabetes appeared so soon after an infectious process that it seems reasonable to consider the diabetes as in all probability the result of the same cause as the infection. In one of his cases influenza was the infection which was followed by diabetes; while in another, a severe angina, accompanied by fever, was apparently the exciting cause of the disease.

In this connection, a case seen by me may be mentioned. The patient was a young woman, aged twenty-five years, who had always been unusually strong and healthy. Following an attack of fever, a marked glycosuria developed. From then on the urine constantly contained sugar, sometimes as much as 9 per cent. being found.

[1] Lancet-Clinic, July 25, 1908.

[2] Berliner klin. Woch., vol. xlv, No. 38.

[3] Ibid., No. 11.

Although she apparently remained in good health, during the next year, the patient gradually developed considerable polyuria, thirst, and some loss of weight. A little over a year after the onset of the glycosuria, following a period of physical and nervous strain, diabetic coma supervened, and the patient succumbed.

Ehrmann[1] records a curious case of glycosuria, apparently the result of syphilitic infection. The patient was a healthy man, aged forty-six years. He had never had any nervous disease, and his family history was absolutely free from all suggestion of diabetes. He acquired a syphilitic infection and, synchronously with the appearance of the secondary skin lesion, manifested undoubted evidences of diabetes. After the mercurial inunctions were stopped and the patient was put on an antidiabetic *regime* for eight days, his glycosuria and other diabetic symptoms entirely cleared up. Ehrmann suggests that the cause of this unusual occurrence was a temporary interruption of the intestinal secretion of the pancreas, as a result of the action of metabolic products elaborated by the Spirocheta pallida.

Conjugal Diabetes. The question of conjugal diabetes stands in close relation to the possible infectious origin of that disease. Senator[2] has gone at some length into the subject of conjugal diabetes and the contagiousness of diabetes mellitus. Among 516 married patients with diabetes, whom Senator has himself observed, there were 22 instances of this disease in husband and wife simultaneously. In the remaining 19 bona fida examples of the condition, the patient had been married a long time, from twenty-three to forty-two years. After diabetes developed in a husband or wife, periods varying from one to fifteen years passed before the disease appeared in the mate. Heredity, he believes, may play some part in the transmission of the disease, but he doubts whether today we are justified in assuming that diabetes can be actually transmitted from one individual to another, if the individuals are not blood relations. The percentage of cases reported, in which such transmission is alleged to have occurred, he holds, is much too small to warrant positive conclusions.

In addition, he reports a number of instances most suggestive of the transmissibility of diabetes. For example, he speaks of the case of a man whose wife's mother and father both had the disease, who developed diabetes soon after his marriage. Again, he mentions that in a small town of 2500 inhabitants diabetes occurred in six people; one of these conducted a tavern frequently patronized by the other five, and all six were near neighbors. He also mentions a physician who lived near four other diabetics, but who developed the disease himself soon after performing an operation for diabetic gangrene of the leg.

[1] Deutsch. med. Woch., vol. xxxiv, No. 30.

[2] Berliner. klin. Woch., vol. xlv, No. 4.

Croftan[1] also has entered upon the discussion of conjugal diabetes. He is most emphatic in stating that in the majority of these cases the occurrence of the disease in both husband and wife must be looked upon as something more than a mere coincidence. He also believes that whenever one member of a married couple develops diabetes, it should be made a rule to look for the disease in the other.

Unschuld[2] states that between 1897 and 1906, among 1405 diabetics, 1.4 per cent. were married couples. Undoubted heredity was present in 2.8 per cent. of these cases, while in 2.3 per cent. the disease was reported present in sisters. Where diabetes occurred in sisters, heredity could be absolutely eliminated in only 1 per cent. of cases.

Renal Diabetes. Experimentally the administration of phloridzin appears to cause a glycosuria due to some alteration in the permeability of the renal cells to glucose, without the occurrence of hyperglycemia; but there is still room for doubt as to whether clinically so-called "renal diabetes" actually exists. To the at present small number of such cases reported, Bönniger[3] now adds another which he regards as true renal diabetes.

Bönniger's patient was an alcoholic male, aged thirty-seven years, who had 2 per cent. of glucose in his urine. The amount of glucose was uninfluenced either by the excessive ingestion of carbohydrates or by keeping the patient on a fat proteid diet, and at all times there was an abnormally low percentage of sugar in the blood. He had this case under careful observation for nearly a year; and during that time the patient's urine only became sugar-free during a period of delirium tremens; but subsequently the glucose reappeared.

The cause of diabetes has also been dealt with by Torand.[4] He mentions the role played by heredity in this disease, but also points out that the adrenals, pancreas, thyroid, and diet are all implicated more or less in the etiology of diabetes. He lays great stress upon the influence of diet, contending that meat and sugar, when ingested excessively, are important etiological factors, because of the changes in the pancreas and thyroid particularly, which they are capable of causing under this condition. He found that large quantities of meat were especially prone to cause thyroid changes. In dogs he has observed this gland to be the seat of colloid degeneration after diabetes had been produced by pancreatic extirpation. This fact, together with other evidence, leads him to the conclusion that there is an intimate connection between the various ductless glands.

A most startling view of the etiology of diabetes has been put forth by

[1] New York Medical Journal, July 25, 1908.
[2] Berliner klin. Woch., vol. xlv, No. 20.
[3] Deutsch. med. Woch., vol. xxxiv, No. 18.
[4] Glasgow Medical Journal, May, 1908.

Eccles,[1] under the title of "Darwinism and Diabetes." His conceptions are so unusual and unique that they warrant comment. A quotation from one of his early paragraphs best indicates the trend of his reasoning. He says: "It needs but a momentary contemplation of any organism for an intelligent physician to perceive that it is defended at every point by some more or less effective appliance—protective against micro-organisms. To a consistent believer in natural selection these can all have but one meaning. They are there because they have been selected as life-saving. They are survivals in past struggles against disease. Their adaptiveness is evidence that the organisms possessing them have survived through such possession." Since the healing forces are as much physiological as are those of assimilation and growth, the consistent evolutionist must consider pathology merely as readapted physiology. Having announced his belief in this evolutionary method of thought in the contemplation of disease, he continues by stating that the present attitude of the medical profession toward hyperglycemia and glycosuria is nothing short of pre-Darwinism. Instead of regarding the presence of sugar in the blood and urine as one of nature's maladjustments, he suggests that it may be an attempt on the part of nature at a conservative process, calculated to protect rather than to injure the organism.

Eccles points out how every effort, so far, both clinical and experimental, to explain the true cause and significance of the overproduction of sugar in diabetes has failed; and that today, in spite of the vast amount of research that has been done, we are still in ignorance as to the cause and cure of diabetes. Therefore, he says, let us reverse our tactics and "try the Darwinian idea for a while, and assume that sugar is being wasted as a physiological reaction to overcome some present irritant of exogenous origin." He argues that every bodily energy is directed toward supplying the excess of sugar, and toward retaining it in the circulation. Besides, in diabetes all food, even the proteid, may ultimately be worked up into dextrose. In short, he asserts, "If the excess of sugar is of no use in the blood, how came all the organs to be working together to keep it there?"

In pursuance of his argument that the sugar is a protective rather than a destructive agent, he cites the fact that a fasting organism is more susceptible to alimentary glycosuria than a well-fed one, which, on evolutionary grounds, is to be expected; since the fasting organism is also more susceptible to invasion by pathogenic organisms, and it is but natural that the slightest bacterial attack should produce a pouring out of sugar in the fasting animal. Cold and cold drinks, he states, are a cause of glycosuria, which is significant when we consider that all living matter, both vegetable and animal, reacts to the depressing influence of cold by a hyperglycemia.

[1] Medical Record, May 9, 1908.

He points out how in diabetes restriction of the carbohydrate diet causes proteid destruction and waste; whereas, it has been shown that when patients are put on von Noorden's oatmeal diet, or on the potato-starch diet of Morse, their glycosuria decreases, their symptoms abate, and they gain strength. He reiterates, in addition, the well-recognized fact that a sudden withdrawal of carbohydrates may lead to acidosis and coma. Furthermore, he asserts that those who live where cane sugar is grown, and partake freely and constantly of this carbohydrate, rarely are the victims of diabetes. White, on the other hand, says that diabetes is common among those races whose daily dietary approaches the usual diabetic diet, and consists largely of meat, fish, fowl, and comparatively little sugar and starch.

In short, from the foregoing facts and many others, he argues elaborately that our present methods of treating diabetes, based, as they are, on what he regards as an erroneous conception of the condition, serve only to make matters worse, and tend toward ultimately harming rather than aiding the organism.

In a subsequent contribution,[1] Eccles further continues his application of the Darwinian doctrine to diabetes. He first takes up the theory of heredity as the cause of diabetes, but dismisses it on the ground that, from the standpoint of natural selection, a truly hereditary disease cannot exist. Besides, true heredity is a heritage of health and health-producing appliances only. As he says, it would be absurd to accuse heredity of being the cause of a disease, since such accusation would deny the doctrine of natural selection.

He considers that to regard merely the loss of glycolytic power as the cause of diabetes, is to ignore many other equally important factors that must first be satisfactorily explained.

His own suggestion is, that diabetes is caused by a bacterial blood infection. He conceives that this may be due to some common organism; as, for example, some habitant of the intestine, which grows best in sugar, but also in proteolytic. When, for any reason, the supply of dextrose in the intestines becomes diminished, such an organism could enter the portal blood, and, arriving at the liver, would there increase about the glycogen stores. The liver would, according to natural selection, respond by giving out more sugar to these organisms. By positive chemotaxis they would also be drawn to the muscles. Finally, when saturated with sugar these hypothetical bacteria would drift away, and eventually land at the kidneys, if not destroyed beforehand by phagocytes. Then, in order to prevent injury to the renal and bladder cells, these organisms would have to be kept surfeited with sugar; hence the constant overflow of sugar in the urine, which continues until the bacteria are destroyed or eliminated.

[1] Medical Record, May 9, 1908.

Such a theory of the causation of diabetes, fantastic and unreasonable as it may seem to some, is asserted by Eccles to be essential to the Darwinian explanation of the disease, and to explain satisfactorily more symptoms of diabetes than any hypothesis hitherto advanced has ever been capable of doing.

The recent advances in our knowledge of the etiology of diabetes have been carefully reviewed by Blumenthal.[1] Although not conclusively demonstrated, he believes the chief cause of diabetes is a lack of those substances in the pancreas whose function it is to promote glycolysis through enzyme activity. He regards the muscles as the chief seat of the oxidation of sugar, and they have been proved to be diabetogenetic by the fact that glycosuria always occurs, if the ability of the muscles to oxidize sugar is in any way impaired. The nervous system, too, holds a place in the etiology of diabetes, by reason of its controlling power over all metabolic processes.

The production of sugar from fat is, according to this writer, still an unsettled question; but it is established that in diabetes the sugar is derived from the carbohydrates, and also from the albumin, especially from the amido-acids of the latter bodies. There remains now no doubt, he states, that acetone can be derived from albumin.

The Symptoms of Diabetes. Beal[2] has made a careful statistical study of the symptomatology of diabetes. In addition to glycosuria, he finds the most characteristic symptoms to be excessive thirst, increased appetite, polyuria, dryness of the mouth and skin, dry brittle hair, and emaciation. This latter symptom is especially marked in the young. Besides glycosuria, he records sugar in the sweat and tears as not uncommon. He says that in the tropics loss of sexual power and loss of the patellar reflex occur among the most prominent early symptoms. He quotes some authorities as stating that defective accommodation and retinitis are found in 20 per cent. of all cases, and should be classed among the early diagnostic symptoms.

The gastro-intestinal symptoms he gives as decreased acid saliva, carious teeth, soft and spongy gums, red, smooth, furred tongue, along with chronic gastritis and constipation. He states that some observers have described cases in which there occurred tenderness over the head of the pancreas and along the course of the descending colon, upon deep percussion and palpation. Myalgias, neuralgias, muscular cramps, and intermittent limping are put down as not uncommon symptoms in the disease.

The urine, in addition to the glycosuria amounting to from 1.5 to 8 per cent., as he points out, may sometimes have a specific gravity of only 1.005, even when sugar is present, although, as a rule, the specific

[1] Deut. med. Woch., vol. xxxiv, No. 43.

[2] American Medicine, January, 1909.

gravity is much increased. He says that when fever is present, the amount of sugar found in the urine is usually decreased. This condition of affairs is sometimes noted when tuberculosis complicates the diabetes. Quoting Boas, Beal asserts that in 325 cases oxylate of lime was present in 26.5 per cent., and uric acid in 14.5 per cent. He regards albuminuria as usually of late occurrence; it is, for the most part, a manifestation of the arteriosclerosis that often develops.

The most common complications are put down by Beal as pruritus, eczema, and erythema about the external genitalia, and carbuncles and furuncles. The occurrence of carcinoma in diabetes is held to be excessively rare; of Naunyn's 225 cases, only 8 showed carcinoma. In this country, by far the commonest complication is pulmonary tuberculosis; more than one-third of the diabetics die of this disease.

Beal has found that about one-half of all cases terminate fatally in diabetic coma, a condition found more often in those under forty than in older patients. He recognizes three separate varieties of coma, based upon different groups of symptoms: (1) The ordinary variety, associated with headache, drowsiness, nausea, and, later, vomiting and unconsciousness; (2) the group which is ushered in by sudden collapse; (3) the class in which the symptoms closely simulate those of acute alcoholism. The symptoms of coma which he particularly emphasizes are dilatation of the pupil, loss of reflexes, small, weak pulse, an absence of convulsive seizures along with the odor of acetone on the breath and the appearance of oxybutyric acid, diacetic acid, and acetone in the urine, which may at times be the first indication of beginning coma.

Epileptic Convulsions in Diabetes. Conner[1] asserts that a certain number of the epileptiform attacks which are found associated with diabetes mellitus are direct manifestations of the diabetic intoxication; while a considerable proportion are merely the result of such associated conditions as uremia, meningitis, etc., the convulsive seizures due to the diabetes itself may be general or local, and are identical with the convulsions of true epilepsy, particularly of the Jacksonian type. The difficulty of properly interpreting these convulsions is increased by the fact that they closely simulate the symptoms of circumscribed brain lesions, since they are frequently accompanied by temporary palsies of the muscles involved, by aphasia, and by various sensory disturbances. The attacks, he says, may accompany the final coma, or they may precede its development by some weeks. In any event, the convulsions may stop as soon as there is improvement in the diabetic symptoms. These epileptiform seizures are not always associated with acidosis; indeed, Connor quotes several cases in which it is positive that there was no acid intoxication.

Psychosis in Diabetes. The occurrence of psychosis in diabetes has been investigated by Kauffmann.[2] He cites a case from his own experi-

[1] Medical Record, May 16, 1909.

[2] Munch. med. Woch., vol. lv, No. 12.

ence, in which a marked psychosis quickly disappeared when a rigid antidiabetic diet was instituted.

Diabetes in Children. Wilcox,[1] in an admirable paper on diabetes in infants and children, states that in youth the symptoms of this disease show no peculiarities. In the majority of cases collected by him attention was first drawn to the increased thirst, which was usually associated with fretfulness and a disinclination to move about or play. For obvious reasons, increased appetite was difficult to determine, but emaciation was marked in that group of young patients which, from the start, did badly; in others, again, there was no noteworthy loss of weight. In two cases he found tenderness over the pancreas as an early symptom. In a number of cases it was noted that the reflexes were lost or diminished, with the increase or decrease of sugar in the urine.

In the cases analyzed by Wilcox the urine varied in amount between 700 and 7000 c.c. in twenty-four hours, while the specific gravity ranged between 1.020 and 1.040. The lowest specific gravity observed was 1.008, and the highest 1.070. The average amount of sugar present was 4 per cent.; the amount fluctuated with the time of day and with the ingestion of food. It was lowest at night and highest at mid-day, and, again, early in the evening. In nearly all the cases acetone and diacetic acid were found in the urine; and usually their appearance was of grave significance.

The Resistance of Diabetics to Infection. J. C. Da Costa, Jr., and Beardsley,[2] recognizing the susceptibility of diabetics to infections, as shown by the frequent occurrence in these individuals of boils, carbuncles, and pulmonary tuberculosis, undertook the study of the resisting power of the blood, as indicated by the opsonic and phagocytic indices, in a series of seventy-four cases of diabetes mellitus and related conditions. They studied the behavior of the opsonins of the blood in connection with Staphylococcus pyogenes, the Streptococcus pyogenes, and the Bacillus tuberculosis. The work was done with the greatest care, and they believe that they are warranted in drawing the following conclusions from their results:

1. In diabetics, as a class, the resisting powers of the blood against bacterial infection are conspicuously subnormal in comparison with a similar hemic property in healthy individuals. As measured by the opsonic index, the average diabetic resistance is approximately one-third below normal; and in the exceptional case reduced more than two-thirds. This applies to infections by the streptococcus, the staphylococcus, and the bacillus of tuberculosis, whose relative predilection for the diabetic is expressed by the order given.

2. The higher grades of diabetic glycosuria are attended with a fuller opsonophagocytic action than the lower grades; and the reverse of this

[1] Archives of Pediatrics, September, 1908.

[2] American Journal of the Medical Sciences, September, 1908.

is also true. This deficiency is particularly striking in the case of the tubercle bacillus.

3. Diabetic acidosis, particularly, lowers the blood resistance to the bacillus of tuberculosis; but a less degree of vulnerability appears to exist with regard to the streptococcus and the staphylococcus.

4. Diabetic furunculosis does not materially depress the subject's opsonophagocytic powers to the ordinary pyogenic cocci below the figures usually incident to this disease.

5. Diabetics affected with pulmonary tuberculosis show virtually the same resisting power as do subjects of uncomplicated diabetes.

6. In non-saccharine diabetes, the opsonic values to the staphylococcus range within normal limits, and this statement also applies to non-diabetic glycosuria.

The Diagnosis of Diabetes. Under ordinary circumstances, the diagnosis of diabetes mellitus offers but little difficulty; but, as has been previously mentioned by me,[1] when glucose has been positively recognized, it remains to determine its significance. It must be borne in mind that, in spite of the laxity with which the terms are often employed, glycosuria and diabetes are by no means strictly synonymous terms. True diabetes is distinguished from conditions of mere glycosuria by the lasting and more or less uninterrupted presence of glucose in the urine and the attending well-known symptoms. In the above-mentioned paper, it was pointed out that true diabetes may properly be divided into two groups, the mild and the severe forms. The former is much the more common, and usually embraces that group of stout, plethoric individuals in whom sugar first appears in the urine at the age of fifty years, or older. On the other hand, the severe forms of diabetes are most often met with in the young or in children, and are associated with the typical symptoms of polyuria, increased thirst, and excessive appetite. It must be emphasized that in making a diagnosis too much reliance should not be placed upon these three symptoms, since they are, as a rule, wanting in the milder type of cases.

Wilcox[2] has called attention to the difficulty and importance of making the diagnosis of diabetes in children and infants. The frequency with which the disease escapes detection in the young is partly accounted for by the fact that the chief interest of most practitioners lies in adults, rather than in children; and more especially, probably, because of the difficulty experienced in securing specimens of urine from young children.

Inasmuch as heretofore there has been no method of determining the glucose-capacity of children, as has been done for adults, Wilcox attempted to do this by feeding children varying amounts of glucose and then examining the urine. The bladder was emptied and the glucose given, and the urine next passed was tested by Fehling's solution. As the result

[1] Pennsylvania Medical Journal, September, 1908.

[2] Loc. cit.

of this method, he found that children between three and five had sugar in the urine after ingesting 30 grams; whereas, children between five and ten, or over, gave positive findings of glucose in their urine after 56 grams were taken.

The Treatment of Diabetes Mellitus. With the exception of the enormous amount of work done on the pathological physiology and etiology of diabetes, no division of the subject receives such universal attention as does the treatment of diabetes.

Management of the Diabetic. After discussing the nature of diabetes and the various etiological factors of importance, Osborne[1] enters in some detail into the question of the treatment of diabetes. He believes that the first point in the management of the case is to determine whether we are dealing with a glycosuria or with an actual diabetes. If the former condition only exists, then, with proper attention to the diet, a modification of mental worry, work and exercise, with good air, and perhaps suitable warm bathing and massage, the patient may, with impunity, be allowed to remain close to the ordinary conditions of life. On the other hand, if the case is one of true diabetes mellitus, the patient should, if possible, move to a warm climate, free from marked and sudden temperature changes. He says that diabetic coma may be precipitated by a sudden change from warm to cold, and that care should be taken to guard a patient against such a catastrophy.

He calls attention to the danger of a sudden withdrawal of carbohydrates and heat-producing substances from the diet, without offsetting such withdrawal by the addition of an increased amount of fats, such as butter, olive oil, and cod-liver oil. Osborne is in accord with Pavy[2] when he asserts his belief that most so-called starch-free gluten foods contain considerable starch—a fact which has allowed many diabetics to live months longer than would have been the case had they actually been on a starch-free diet, as it was thought they were. His own method of diet is to remove all starches and sugars except bread, for a time; then, depending upon the amount of sugar in the urine and whether or not there is diacetic acid present, he gradually reduces the bread. As long as diacetic acid continues absent and the amount of sugar decreases, he reduces the bread to a minimum. When, in spite of diet, sugar continues, he finds the amount of starch necessary to keep the patient from eating enormous amounts of proteid, in order to satisfy hunger and keep up weight. He allows such patients a small amount of starch at each meal, in the form of a slice of bread or an equal amount of potato. If the patients complain of cold, they are allowed a lump of cane sugar, from time to time, in order to prevent the destruction of too much proteid in the continued production of glucose. If, however, at any time, diacetic acid is found in the urine, the starches are immediately increased.

[1] American Journal of the Medical Sciences, April, 1908. [2] Loc. cit

In the use of the various organic extracts and digestive ferments, so highly recommended, Osborne places no reliance whatsoever; nor does he believe that more than temporary benefit can be derived from the various drugs, such as salicylates and benzoate and guaiacolate compounds, all of which, when used over any prolonged period of time, may actually do harm. He contends that opium and its alkaloids can do no good, since, at best, they tend merely to reduce the excretion of sugar, which is not the disease, but only one symptom of it. Moreover, the prolonged use of opium exposes the patient to the added danger of the opium habit.

For threatened diabetic coma, he recommends that the carbohydrates be pushed, and alkalies, in the form of sodium bicarbonate, be freely administered. If coma has once developed, he regards the outlook as practically hopeless; for, although the patients may be awakened by the employment of venesection and the intravenous use of bicarbonate of soda, or, what is equally efficient, physiological saline solution, there is no permanent cure; and in twenty-four to seventy-two hours they again relapse into coma.

Stark[1] urges that most careful urine analysis be done before a definite line of treatment is instituted. All drugs, he says, should be suspended for a day and a twenty-four hours' specimen be collected. Then, before testing for sugar, the acetone bodies and the probable presence of pentose and lactose should be determined. All albumin should be removed from the urine by boiling, and the specimen should be filtered through animal charcoal, in order to remove the urea, uric acid, creatin, and coloring agents. Once having accurately determined the condition of the urine, the suitable diet can be arranged, never forgetting, however, that in no circumstances can a rigid, one-sided diet be borne for any length of time without bad results. He believes that underfeeding must always be carefully guarded against. He argues, with other observers, that in bad cases of true diabetes that are on a rigid protein diet, fats, freely administered, are of great service.

Oatmeal Diet in Diabetes. Herrick[2] has upon several occasions, discussed the oatmeal treatment ("Naferkur") advocated some years since by von Noorden in the treatment of certain cases of diabetes. He describes the diet as consisting of 250 grams of oatmeal, 250 to 300 grams of butter, and 100 grams of some vegetable albumin, such as roborat. For this latter substance, the white of six to eight eggs is usually substituted. After the oatmeal is thoroughly cooked in water for two hours, the butter and eggs are thoroughly stirred into it, and salt is added. This is the diet for one day for an adult, and is fed to the patient every two hours, in equal portions.

[1] Medical Record, April 11, 1908.

[2] Journal of the American Medical Association, March 14, 1908, and Illinois Medical Journal, March, 1908.

Herrick points out that this diet is suitable only for the typical severe cases of true diabetes, with polyuria, emaciation, weakness, etc., in whom threatening coma is made evident by the acetone bodies and ammonia content of the urine. He insists that the diet must be used carefully, and only in selected cases, as mild diabetics are made worse by it. After keeping suitable cases one to two weeks on this diet, he cautiously brings them back to the regular diabetic diet, by gradually substituting other food for some of the oatmeal feedings. The explanation as to just how this oatmeal cure accomplishes the good it sometimes appears to, Herrick is unable to give.

His experience with this diet has been, upon the whole, gratifying and encouraging. He has found it especially useful in managing the notoriously difficult cases of diabetes in children. In conclusion, he states that while the diet is not suited to all cases, being of least avail in the mild forms, and while no claims as a cure of diabetes can be made for it, it still remains a most valuable therapeutic agent for the warding off of impending coma, and for assisting in the establishment of a carbohydrate tolerance.

Pari[1] makes an interesting report of a case of severe diabetes in a young man who was benefited by the use of von Noorden's oatmeal cure. While the oatmeal was being given him, metabolic analyses were being done. These analyses proved satisfactory, and, in addition to showing the advantages of this diet, indicated that oatmeal starch must differ from other starches in some specific physiological manner.

Specific Ferment Therapy. The use of specific ferments in the treatment of diabetes has been tried by Zuelzer.[2] He had previously shown that in experimental animals the production of adrenalin in diabetes could be prevented by the injection of pancreatic extract. Now, he reports the results obtained from the injection of the pancreatic extract made from the pancreas taken from an animal at the height of digestion, in cases of experimental diabetes in animals and of true diabetes in man. The animal experiments showed uniformly a reduction in the amount of sugar excreted for several days after the injection.

In man, likewise, the results were sufficiently uniform to be encouraging. One patient was a man, aged thirty years, whose urine contained, on a restricted diet, 6 per cent. of glucose. Coma developed in this patient after an amputation for diabetic gangrene. When almost moribund, a subcutaneous injection of 30 grams of pancreatic extract in water was given him, and the next day another injection of 5 grams. The state of the patient was such that, unfortunately, during the days following these injections, his urine was lost; but his toxemia lessened and his mental condition improved. The patient died, seventeen days

[1] Gazetta degli Ospedali e delle Cliniche, Milan, May 31, 1908.

[2] Zeitschr. f. exp. Path. u. Therap., 1908, vol. v, p. 306.

after the first injection; and, though the results in this instance are inconclusive, it is evident that the injections did no harm, and possibly some good. Another patient was a young man, aged twenty-seven years, who had from 2 to 6.4 per cent. of sugar in his urine, with acetone and diacetic acid always demonstrable. An injection of 1 c.c. of the extract was given him intravenously; and, as the result, the sugar fell to 1.3 per cent. in 1400 c.c. of urine; but acetone and diacetic acid continued to be present. On the day following a second injection of 2 grams of pancreatic extract, diacetic acid and acetone entirely disappeared, and remained out of the urine for three days. The sugar, after the second injection, also began to diminish still farther, until, on the third day after the last injection, only the faintest trace of glucose could be detected. Six more cases of diabetes, of varying age, were treated with these injections, with uniform results. The sugar diminished markedly, and within two to three days had entirely disappeared from the urine. Acetone and diacetic acid, when present, also became entirely absent. In all the cases the patients were kept on the same diet after the injections.

These injections appear to have been harmless, and were only occasionally followed by unpleasant symptoms. The most severe results were chills, followed by a little elevation in temperature. Stomatitis also occurred several times as a sequel, but none of these symptoms persisted more than a couple of days.

Zuelzer considers that his results are suggestive, in that, by means of injections of pancreatic extracts, he was always able to cause sugar, diacetic acid, and acetone to disappear from the urine of true diabetics.

OPHTHALMOLOGY.

By EDWARD JACKSON, M.D.

DISEASES OF THE CONJUNCTIVA.

The Ophthalmo Reaction. The general diagnostic significance and value of the reaction of the conjunctiva to tuberculin and other bacterial emulsions are considered elsewhere.[1] They have no especial significance with reference to ocular diseases or lesions. Indeed, the local reaction which may occur in the eye after the subcutaneous injection of tuberculin is far better evidence of the tuberculous nature of the eye lesion than is the reaction of the eye when tuberculin is placed in the conjunctiva. The latter can only indicate that tuberculosis affects or has affected some part of the body.

But there are certain *dangers* connected with the ocular reaction that greatly limit the field for its application. From the first it has been advised not to apply the test to a diseased eye; partly because the pre-existing disease obscures what might be termed the normal specific reaction, and partly because of recognized danger to the diseased eye subjected to the test. Waldstein[2] points out that the condition of the conjunctiva influences decidedly the intensity and duration of the reaction. A slight follicular or chronic conjunctivitis, which might readily be overlooked, can be the cause of a severe reaction in a healthy person. Weber[3] had five healthy physicians irritate their eyes, by sitting up late reading by artificial light. Then the tuberculin was instilled. All of them gave a reaction, and in three the reaction was severe.

It is not enough that the eye seems entirely free from irritation at the time the test is made. Any slight opacity in the cornea indicating previous inflammation must be regarded as an indication of danger. Barbier[4] instilled tuberculin in the eye of a child that had suffered from keratitis several years before. The cornea became inflamed and perforated, with destruction of the sight. Smoljaninow,[5] employing the test on an eye that had old corneal opacities, produced a central perforating ulcer. By trying the ophthalmo reaction on an eye that appeared healthy, Derby[6] caused an attack of episcleritis. But on more careful

[1] Progressive Medicine, June and September, 1908.
[2] Klinische Monatsblätter f. Augenheilkunde, March, 1908
[3] British Medical Journal, February 15, 1908.
[4] Klin. therap. Woch., 1908, No. 2.
[5] Klin. Monatsbl. f. Augenheilk., April, 1908, p. 432.
[6] Transactions of the American Ophthalmological Society, vol. xi, Part III

examination of the cornea he found it presented faint opacities from a former keratitis. Eyes that have suffered from phlyctenular disease are especially apt to be unpleasantly affected by the tuberculin test.

Even when the eye on which the test is to be applied is, and has always been, quite healthy, if the other eye is diseased, the test is not free from danger. Knapp[1] saw a girl, aged nine years, suffering from scrofulous suppurative keratitis in the right eye. Wishing to test for tuberculosis, he instilled a drop of a 1 per cent. tuberculin solution in the left eye. A violent reaction occurred, with fever, and after ten days infiltration of the cornea, with newformed vessels—in brief, an interstitial keratitis that ran the course of a typical tuberculous process.

Although in the great majority of cases the ocular reaction to tuberculin is not a serious matter, it is not free from risk even when both eyes are healthy. Satterlee[2] saw a coarse, vascular keratitis, which required several weeks of treatment, develop in a girl, aged eighteen years, with tuberculous adenitis. Mackay[3] observed prolonged inflammatory reaction, with a severe relapse at the end of five weeks, and photophobia still present at the end of ten weeks. Polland[4] records three cases that did badly, two of which were left with permanent defects of the cornea, and one with considerable impairment of sight.

The *cumulative effect* of instillations of tuberculin is another source of possible danger to patients who go from one physician to another. This cumulative action was tested by Rosenau and Anderson.[5] They instilled the 1 per cent. solution of tuberculin in the eyes of twelve healthy persons. No reaction was obtained in any case. Fifty-one days afterward a second instillation, of the same preparation in the same eyes, gave a typical tuberculous reaction in ten of them, which was rather severe in eight. Derby reports the case of a negro, who had tuberculosis of the conjunctiva in the left eye, whose right eye was subjected to the test and gave a moderate positive reaction. He was referred to a tuberculosis clinic for general examination, and received another test drop in the previously tested eye. An exceedingly acute conjunctivitis, with immense hard swelling of the lids, resulted. The eye presented the picture of acute gonorrheal disease.

If the test cannot be safely applied to a diseased eye, or to the sound eye when its fellow is affected, its ordinary use has no place in ophthalmology. Whether, as Waldstein suggested, such instillations may have some therapeutic value in diseases of the eye yet remains to be demonstrated. Wolff-Eisner suggested that solutions[6] as weak as 1 to 100,000

[1] Archives of Ophthalmology, March, 1908.
[2] Journal of the American Medical Association, June 27, 1908.
[3] Boston Medical and Surgical Journal, March 12, 1908.
[4] Wiener klinische Wochenschrift, July 9, 1908.
[5] Journal of the American Medical Association, March 21, 1908.
[6] Klin. Monatsbl. f. Augenheilk., February, 1908, p. 181.

may be used, safely and repeatedly, in diseased eyes. But this needs to be further tested before any opinion can be expressed either as to its safety or as to its practical usefulness.

Bacterial Conjunctivitis. Ophthalmia Neonatorum. Among 1483 cases reported by various observers, Mayou[1] finds that 63.5 per cent. were due to the gonococcus; and of 40 cases in his own practice, 57.5 per cent. showed this germ. He finds that there are nearly 3000 children, under fifteen years of age, in England and Wales, who are blind from this disease, and that they constitute 27 per cent. of all the inmates of schools for the blind in England. Thomson,[2] who has carefully reviewed the recent voluminous literature of the subject, concludes that "the method of Credé, if carried out correctly, in every child born, and followed by prevention of secondary infection, would practically stamp out the disease. Catarrhal symptoms would appear in many cases. Such catarrhal conjunctivitis, provided that its cause is fully recognized, seems a small price to pay for the advantages gained. If 1 per cent. silver nitrate were used instead of 2 per cent., there would be less catarrh and equal protection. Simple cleansing methods of prophylaxis, without the use of germicidal applications to the eyes, are nearly as good as the Credé method, provided (*a*) the details are faithfully and intelligently carried out; and (*b*) infection has not already taken place."

The opinion that *weaker solutions* of nitrate would be at least equally effective as a prophylactic is shared by Greeff,[3] who believes that for the Credé method of prophylaxis, 0.25 per cent. solution is strong enough. He maintains that in newborn children every case of gonococcus conjunctivitis is curable; and states that at the Charité in Berlin the results of treatment have been better since the 0.1 per cent. solution of silver nitrate has been employed than they were under stronger solutions. With the weaker solution the eyes are irrigated every two hours, day and night, until the violence of the disease has begun to abate. These more frequent applications may account for the greater efficiency of this treatment, since strong solutions of silver nitrate cannot be safely applied to the conjunctiva more frequently than once in twenty-four hours, and it is sometimes better to make the intervals still longer. De Schweinitz[4] thinks that only the "vast majority of cases," not "every case," are curable. He does not agree with the high estimate that has been placed by some on the value of the *organic salts of silver* in the treatment of this disease, or for its prevention. He knows of three maternity hospitals in which argyrol has been abandoned as a prophylactic because it was entirely unsatisfactory, and a modified Credé method reintroduced.

[1] Practitioner, January, February, and March, 1908.

[2] Ophthalmoscope, May, 1908.

[3] Wochenschrift f. Therapie u. Hygiene des Auges, March 5, 1908.

[4] Ophthalmic Year Book, 1909.

Metastatic Gonorrhea of Conjunctiva. In his elaborate monograph on ocular manifestations of systemic gonorrhea, Byers[1] finds that of the 70 cases that have been recorded in the literature, the sex is mentioned in only 38, but these are all males. The attack is apt to involve both eyes. In but 2 cases is it known to have been unilateral; and in many cases the two eyes are attacked simultaneously. In two-thirds the inflammation was confined to the conjunctiva. In the others the deeper coats of the eye were also involved. Microscopic examination of the discharge shows complete absence of the gonococcus. In cases of inflammation confined to the conjunctiva the prognosis is entirely favorable. The average duration of the case is approximately two weeks. But it may vary from five days to six weeks.

Diplobacillus Conjunctivitis. This is regarded by McKee[2] as "perhaps the commonest and most widely spread disease of the conjunctiva." He is inclined to believe its subjective symptoms more severe than they have usually been thought. It occurs largely among people who make little complaint of pain, those living outdoors, and children. Clinically, it may vary from a mild catarrhal conjunctivitis to an acute purulent inflammation. Brown Pusey[3] has had the opportunity of making a microscopic study of the lids and conjunctiva of a man with chronic blepharoconjunctivitis. The diplobacillus of Morax and Axenfeld had been found in the discharge before death. It was found among the desquamated cells and in rather small numbers between the epithelial cells of the superficial layers, which had not yet been thrown off. Apparently it did not penetrate the epithelium deeply. But at the lid edges and at the corneal margin there were epithelial ingrowths, surrounded by vascular, infiltrated, subepithelial tissue. In the treatment of this disease McKee has seen no case which the zinc sulphate failed to cure. He has used it by frequent irrigations of the conjunctival sac with a weak solution, one-half grain to the fluidounce, three or four times daily, which give "exceedingly satisfactory results."

Pneumococcus Conjunctivitis. An epidemic of conjunctivitis in which the pneumococcus seems to have been the pathogenic organism is reported by Alt.[4] It began the last of January and continued until July, during which period Alt saw 76 cases in private practice, and more than this in clinics. In two instances three members of a family were affected. The others occurred, so far as known, without involving other members of their families. The disease ran its course ordinarily in a few days, without serious complications. Small hemorrhages in the bulbar conjunctiva occurred a number of times, and there was one case each of corneal abscess, lacrymal abscess, and phlyctenules at the

[1] Studies from the Royal Victoria Hospital, Montreal, vol. ii, Part II.
[2] Ophthalmology, April, 1908.
[3] Transactions of the American Ophthalmological Society, vol. xi, Part III.
[4] American Journal of Ophthalmology, September, 1908.

corneal margin. The treatment used was a 25 per cent. solution of argyrol, bathing with boric acid solution, and cold compresses. During the epidemic an eye was lost after cataract extraction from pneumococcal infection.

Adams[1] reports a school epidemic occurring among boys aged from ten to fourteen years. Of 37 in attendance, 21 were affected. Four seemed to suffer relapses. The duration of the cases varied from a week to a month. The epidemic occurred in the spring. No adults were attacked. The clinical appearances were strikingly similar in all cases: aching of the eyes for a couple of days, then adhesions of the lids in the morning, redness of the conjunctiva, and photophobia, the other eye becoming affected the next day. On examination a thin line of muco-pus would be found in the lower folds of the conjunctiva, with general congestion of the palpebral portion of that membrane, and enlargement of the follicles.

Influenza Conjunctivitis has been investigated by Rosenhauch.[2] Two cases occurred as ophthalmia neonatorum, and one in a three months' old child. There were no constitutional symptoms or evidence of other infection; and the bacteriological investigation included inoculation experiments, demonstrating that the influenza bacillus was the pathogenic organism present. Demaria[3] also reports a case in an older child, in which the demonstration of the causative influence of the Pfeiffer bacillus was equally complete.

Pusey[4] reports that in a year of routine work he found the Bacillus pyocyaneus present in the conjunctival sac in two cases. Both patients were young men, one of whom had eyes that had been red and irritable for several months, and worse the last six weeks. The palpebral conjunctiva was swollen and red, the transitional folds showed many large follicles, and the lower part of the ocular conjunctiva was red. There was no more discharge than normal. Smears showed a very few Gram-negative bacilli. Cultures on serum agar showed large colonies of Bacillus pyocyaneus, and small ones of the white staphylococcus. The second patient came for correction of an error of refraction. There had been slight itching and burning of the eyes, but no other evidences of conjunctivitis. Cultures gave the same organisms with the xerosis bacillus. Both cases were treated by zinc sulphate solution; and in two or three weeks the organisms had disappeared and the eyes were normal.

Parasitic Conjunctivitis. Posey and Carpenter[5] each encountered a case in which a boy, after slight mechanical injury to the conjunctiva,

[1] Transactions of Ophthalmological Society, United Kingdom, vol. xxviii.
[2] Klinische Monatsbl. f. Augenheilk., October, 1908.
[3] Arch. de Oftalmologia, Hisp.-Amer., vol. vii, p. 144.
[4] Archives of Ophthalmology, November, 1908.
[5] University of Pennsylvania Medical Bulletin, November, 1908.

developed a papillomatous growth, several millimeters in diameter. The microscopic examination of the tumors, by Hosmer and Allen, revealed in the subepithelial tissues parasitic nodules from 0.17 to 0.33 mm. in diameter. The largest bodies were filled with sporoblasts, by which they were referred to the group of higher fungi, although their exact identity could not be determined.

Trachoma. The peculiar bodies found in the conjunctiva in trachoma, and referred to last year,[1] have been observed by at least a dozen microscopists, including Mijaschita,[2] working in Japan. They have been found by di Santo[3] beneath the epithelium, in the protoplasm of the cells, in the fibers of connective tissue, and most frequently in the connective-tissue spaces. They have not yet been cultivated outside of the body, so that the proof by inoculation of their relation to trachoma is still deficient. Coover[4] practises grattage by rubbing the conjunctiva of the lids and folds with sand paper. No. 0 or 00 is used, and it must not be made with powdered glass. It is cut in strips and sterilized by dipping in alcohol, which is then burned off. The strip, held between the thumb and finger, is rubbed briskly over the surface. No particles of sand have remained after this procedure. From an experience of 35 cases, he claims it to be superior to other methods of grattage.

Pemphigus. Quint[5] reports a case under observation for sixteen years, ending in a complete adhesion of the lids to the eyeball in one eye, and partial symblepharon in the other. There was also pemphigus of the upper air passages. In a case seen by Adam,[6] in which also the disease affected the upper air passages, treatment with atoxyl and fibrolysin was without beneficial result. Bane[7] reports a case the progress of which was watched for several months, and in which pieces of excised tissue were examined with the microscope. The lower cul-de-sac of the conjunctiva was partly obliterated. Exposures to the Röntgen ray, however, checked the process, and after several months it appeared permanently cured.

DISEASES OF THE CORNEA.

Pneumococcus Ulcer. The practical importance of pneumococcus infections of the cornea, Stephenson[8] says, would be difficult to overestimate. He reviews the literature, showing that a very large proportion

[1] Progressive Medicine, June, 1908, p. 321.
[2] Klinische Monatsbl. f. Augenheilkunde, November and December, 1908.
[3] Archiv f. Augenheilkunde, vol. lxi, p. 4.
[4] Ophthalmic Record, February, 1909.
[5] Klinische Monatsblätter f. Augenheilkunde, March, 1908, p. 313.
[6] Berliner Ophthalmologische Gesellschaft, July 9, 1908.
[7] Ophthalmic Record, August, 1908, p. 419.
[8] Ophthalmoscope, March, 1908.

—from 66 to 95 per cent.—of cases of serpent ulcer are due to the pneumococcus. In hypopion keratitis of children, starting from an ulcerative corneal phlyctenule, he found the pneumococcus in 4 out of 7 cases. He has also found it in keratomalacia occurring in young children enfeebled by wasting disease. In one year Gallemaerts[1] had treated 14 cases of pneumococcus ulcer, 10 of which had originated in trauma. Apparently the pneumococcus is unable to attack the cornea when protected by unbroken epithelium. He has used Römer's polyvalent antipneumococcus serum, with varying success. In some cases one injection of 10 c.c. of the serum stopped the pain, caused the hypopion to disappear, and arrested the destructive process. The cases likely to be benefited are those in which the ulcer is surrounded by a white zone, with small separate foci, and in which there is extensive hypopion.

The observations of Morax on the influence of instillations of bile from the rabbit upon pneumococcus infection were mentioned last year. Verderame and Weekers[2] publish a careful experimental investigation of the bacteriolytic *action of bile and its salts* upon pathogenic germs, especially the pneumococcus. They find that neither the bile nor the bile salts in the concentration of 10 per cent. will certainly destroy the pneumococcus when present in exudate. Of the cases in which it was tried clinically, 2 seemed to heal more rapidly because of its use; and in 2 it appeared to be of no benefit. It can only be regarded as an adjuvant to other treatment. It cannot be recommended to check the progress of severe serpent ulcer.

Parenchymatous Keratitis. Most ophthalmologists still hold that parenchymatous keratitis is usually due to inherited syphilis. Von Hippel[3] found the spirochetes most numerous in the parts of the cornea most affected, and thinks the corneal lesions due to the direct action of the parasite. Jacqueau[4] points out that the concomitant concurrence of joint inflammations is an additional evidence of this cause. There is, however, a disposition to give attention to other causes for this lesion. Carpenter[5] reports three, and A. E. Davis[6] two cases of *interstitial keratitis*, occurring in *acquired syphilis*. The cases in general resemble those due to inherited syphilis, except that there is less vascularity, the salmon patches are less likely to appear, and it commonly affects but one eye. It is usually a late secondary or tertiary lesion, arising many years after infection; but in one of Carpenter's cases it occurred within a few months. It yields rather promptly to antisyphilitic treatment, and the prognosis is relatively good. In the discussion of Davis' paper,

[1] American Journal of Ophthalmology, January, 1908.
[2] Klinische Monatsblätter f. Augenheilk., September, 1908.
[3] Graefe's Archiv f. Ophthalmologie, lxviii, Heft 2.
[4] L'Opht. Provinciale, 1908, No. 5.
[5] Annals of Ophthalmology, October, 1908.
[6] Trans. Section on Ophthalmology, American Medical Association, 1908.

Thompson stated that in thirty-eight years' practice he had seen at least a dozen such cases.

Risley[1] reports two cases of parenchymatous keratitis occurring in patients suffering from well-marked symptoms of *myxedema*, cachexia, with peculiar pallor of the skin, general weakness, and torpor of the mind and other faculties; although they were not typical examples of myxedema or of cretinism. The corneal condition failed to improve under general or antisyphilitic treatment, but cleared up rapidly under thyroid feeding. (See also Collin's case referred to last year.)

Parenchymatous keratitis without the formation of vessels in the corneal substance is not a very unusual form when due to acquired syphilis. One of Carpenter's cases was of this character. But when the corneal lesion is associated with inherited syphilis the complete absence of vessels in the cornea throughout its course is certainly very unusual. F. A. Davis,[2] who reports a case of the kind, can find but three similar cases previously reported. In his patient, a colored boy, aged nineteen years, the opacity was comparatively slight; the greatest reduction of vision being $\frac{5}{10}$. It moved slowly across the cornea and cleared up perfectly with use of mercury and iodide, in about five months, with no local treatment except a placebo. The corneal microscope showed the specks of opacity to be in the anterior layers of the cornea. But every attempt to stain the surface with fluorescine was unsuccessful.

Atoxyl for Parenchymatous Keratitis. By intramuscular injections of atoxyl, Stephenson[3] has obtained results never even approached by any of the methods he has hitherto employed. He restricts the dose to 0.25 to 0.05 gram (4 to $\frac{3}{4}$ grains) repeated once a week in the milder cases, and two or three times a week in the more severe cases. In addition he administers mercury, as a rule mercury with chalk, 1 grain three or four times a day. This is an essential part of the treatment. He reports 6 cases, in all of which the improvement was striking, and in some quite extraordinary for this disease.

Opacities of Cornea. A case of brownish or greenish discoloration of the cornea, occurring late in the course of multiple sclerosis, is reported by Salus.[4] The opacity consisted of fine dots situated in the deep layers, close to the corneal margin. They appeared red-brown or green, according to the direction from which they were observed. Previous examination of the eye excluded any congenital anomaly. Three cases have been reported previously, two of which were in patients suffering from multiple sclerosis, and the third from pseudosclerosis. The discoloration was exactly similar in the two eyes. Salus accounts for it by the deposit of pigment from blood cells escaping from Schlemm's canal because of the altered innervation of its walls.

[1] Trans. College of Physicians of Philadelphia, March 19, 1908.
[2] Ophthalmic Record, March, 1908.
[3] Ophthalmoscope, February, 1909.
[4] Med. Klinik, April 5, 1908.

In a case of corneal opacity caused by lime, Windmüller,[1] after trying "fibrolysin" by intramuscular injection, without effect, applied it locally, causing a disappearance or marked reduction of the corneal opacity. He used it in other cases with marked esthetic improvement, and sometimes with improvement of sight. The fibrolysin is applied two or three times a day, after the eye has been prepared for it by dionin applications increased from 2 to 10 per cent.

Peripheral Groove Formation. Cases of this condition have been reported by Gilbert,[2] Handmann,[3] Knapp,[4] and Fleischer.[5] Gilbert recognizes three stages in the development of this condition: a superficial grayish corneal opacity, resembling arcus senilis; next a furrow in the zone of opacity, with its base becoming transparent; and finally, the transparent furrow bulging. As Knapp points out, the gray zone fades gradually toward the periphery of the cornea, but is sharply limited on the side toward the centre. The opacity is usually more or less vascular. Fleischer does not consider it inflammatory. In Knapp's case there seemed to be a history of inflammation in the beginning. Vision is impaired by the distortion of the cornea. It may gradually grow worse, or remain for a long time stationary. Correction of the resulting error of refraction is about the only help that can be given the patient.

DISEASES OF THE UVEAL TRACT.

Inflammations. *Auto-intoxications.* A contribution regarding the possible relationship of auto-intoxication to certain diseases of the cornea and uveal tract is published by de Schweinitz and Fife.[6] Their paper includes reports of 6 cases, in which very careful laboratory examinations were made of the excretions. While it is admitted that no histological changes in the eye have been found characteristic of intestinal auto-intoxication, and no definite toxin has been isolated that could be held responsible for the ocular lesions in these cases, it certainly seems worth while to pursue such investigations. At least, evidence regarding intestinal putrefaction and the nitrogen metabolism of the patient can be obtained; and if the latter is abnormal it can be improved by dietetic regimen. Attention is also directed to a relationship which seems to exist between outbreaks of disease of the uveal tract and diseases of the skin, notably choroiditis, and eczema, herpes zoster, acne, and furunculosis.

In his review of the *etiology of choroiditis*, Lawford[7] refers to the

[1] Med. Klinik, March 1, 1908.

[2] Klin. Monatsblätter f. Augenheilk., August, 1908. [3] Ibid., September, 1908.

[4] Archives of Ophthalmology, May, 1908, p. 341.

[5] Die Ophth. Klinik, May 20, June 5, 1908.

[6] Transactions Section on Ophthalmology, American Medical Association, 1908.

[7] Ophthalmic Record, November, 1908.

importance, in this connection, of poisons manufactured in the tissue of the individual. They may be derived from collections of septic material, as boils, abscesses, pyorrhea alveolaris; or may originate in the products of faulty metabolism; or may accumulate in poisonous quantities from imperfect removal of the products of normal metabolism. He believes it fairly certain that these are important factors in the causation of inflammatory changes in the choroid.

Gonorrheal Uveitis. This is certainly not a very rare condition. Beaumont[1] has seen within twenty years 20 cases of gonorrheal iritis, at the Bath Mineral Water Hospital. Two of these were in women, 18 in men. The interval, often of several years, that elapses between the original gonorrheal infection and the iritis causes the connection to be overlooked, and the iritis to be ascribed to "chronic rheumatism." Byers[2] finds the proportion of cases of iritis ascribed to gonococcus infection varies greatly with different observers, ranging from zero to 17 per cent. He thinks that while there are no local features entirely characteristic of iritis due to this cause, gelatinous exudate in the anterior chamber and marked involvement in the conjunctiva suggest it, while nodular swellings of any kind in the iris tissue speak decidedly against such an origin. A bilateral character of the first attack points rather toward the gonococcus. For purulent iritis from this cause the prognosis is entirely favorable.

Iritis from Various Causes. Beaumont thinks iritis is seldom caused by gout. He also thinks the connection of iritis with *rheumatoid arthritis* is not clear. But enough cases of the kind have been observed to make such connection pretty certain. Burt[3] reports one in which gonorrhea and rheumatic fever were excluded. Skiagrams showed the characteristic changes in the wrist and knee. The first attack of iritis occurred within three months of the onset of the disease. It was painful and showed a tendency to relapse.

Iritis accompanying *inflammation of the parotid glands* has been seen by Adams[4] in 2 cases. In one case the iritis affected both eyes, but only the right parotid and adjoining lymphatics seemed to be involved. In this case infection from decayed and septic teeth was a probable source of trouble. In the other case both parotids were affected, but only the right eye. Adams found no evidence of syphilis, and thought that epidemic parotiditis could be excluded.

Two forms of *gummatous iritis* are illustrated by cases reported by Rollet.[5] In one the material from the disintegrating gumma gives rise to pseudohypopion, that resembles closely the accumulation of pus in the anterior chamber. He reports three cases of this kind yielding promptly

[1] British Medical Journal, July 18, 1908.
[2] Studies, Royal Victoria Hospital, Montreal, vol. ii, Part II.
[3] Ophthalmoscope, January, 1908.
[4] Ibid., February, 1908.
[5] Archives d'Ophtalmologie, May, 1908.

to specific treatment. He also reports one of malignant syphilis, in which gumma appeared at the end of ten months, and one month later the eye had to be enucleated for pain. The patient died four months after that with multiple gummata.

Tooke[1] had the opportunity of examining microscopically an eye affected with suppurative iridocyclitis in the course of epidemic *cerebro-spinal meningitis.* The ciliary body was tremendously infiltrated, and the neighboring vitreous filled with lymphocytes. The choroid was practically normal, although the anterior portion of the retina showed decided infiltration.

Ciliary tenderness is usually regarded as a most significant evidence of cyclitis. Thomson[2] points out that it may arise from cramp of the ciliary muscle, in connection with hyperopia or astigmia. He also states that it may occur in hyperemia accompanying keratitis, iritis, or glaucoma. In acute cyclitis it may be absent. In discussing Thomson's paper, Duane pointed out that tenderness in the upper lid, particularly in the tarsus, may also very readily be mistaken for tenderness in the ciliary body.

Paracentesis of the anterior chamber, performed, if necessary, twice a week, is thought by Denig[3] to exert a favorable influence upon the inflammatory processes of the uveal tract. Usually the paracentesis was followed by improvement of the condition; and where no other change was apparent, the pain became less violent. The opening into the anterior chamber was made with a narrow keratome or Graefe knife, which was very slowly withdrawn, to permit escape of the aqueous. Then, after the anterior chamber had been restored, a few minutes later the wound was again opened once or twice. The operation was done under subconjunctival injections of cocaine, or the use of nitrous oxide.

For local bloodletting, to promote mydriasis and relieve the pain of iritis, Foster[4] finds that a single leech placed on the side of the nose, about one-quarter inch from the inner canthus, where a superficial vein often indicates the location, will be more effective than six leeches placed on the temple.

Uveal Tuberculosis. Verhoeff[5] describes, as an acute type, a group of rare cases, characterized clinically by a tendency to destroy the eye, and histologically by caseation of the lesions. The nature of the disease is usually not recognized until the eyeball has been enucleated and comes to microscopic examination. With the application of the tuberculin tests and treatment, some of the cases may be saved.

Tuberculin Treatment. This continues to receive more attention and to grow in confidence and favor with most of those using it; although

[1] Ophthalmology, July, 1908.

[2] Archives of Ophthalmology, July, 1908, p. 454.

[3] Ophthalmic Record, March, 1908. [4] Annals of Ophthalmology, July, 1908.

[5] Ophthalmic Record, December, 1908.

Derby,[1] from observations on some 30 cases, has not been convinced of its therapeutic value. Lundsgaard[2] treated three chronic and rebellious cases, getting an excellent result in one, and satisfactory results in the others, in spite of the relapses. Alessandro,[3] who had been a skeptic with regard to tuberculin, was driven to a trial of it by the refusal of his patient's parents to permit enucleation. The treatment was extended over one year, during which time various preparations were tried, and bacillus emulsion T. R. chosen as the best. It resulted in the disappearance of the tuberculous mass, which was replaced by cicatricial tissue. The eye retained slight vision, with tension normal, and the patient, a girl, aged thirteen years, continued in good health. Allen[4] points out that after tuberculin injections the negative phase of the opsonic index is especially prolonged, and, therefore, the injections should be made at comparatively long intervals. Sometimes intervals of three weeks are not sufficient, and if the opsonic index is not taken to guide the administration, it is better to allow one month to intervene between the injections. At the other extreme, Rohmer[5] has advised injections of small, gradually increased amounts every second day.

Sympathetic Uveitis. The pathology of sympathetic inflammations continues to be a subject for investigation. Lenz[6] finds the histological changes essentially identical in the exciting eye and in the sympathizing eye, and reasons that this must be due to production by a particular pathogenic organism, which he supposes makes its way from one eye to the other through the blood. He also found obliteration of the retinal arteries, which he ascribes to capillary embolism, and regards this as additional evidence supporting the metastatic theory. Heerfordt[7] concludes that sympathetic uveitis is due to a specific microbic cause, possibly a spirochete, which gains access to the uveal tract, generally through a wound of the eye; and reaches the sympathizing eye through the blood or lymph channels. He thinks the incubation period for this kind of infection is fourteen days. Sympathetic inflammation occurring years after injury he accounts for on the supposition of a new infection, which may occur through an old scar. Parisotti[8] found after experimental injury of one eye a striking increase in the albuminoid contents of the aqueous humor in that eye, and also in its fellow, contrary to what has been observed by others. He concludes that irritation to both eyes follows injury to one, especially if the ciliary body is injured. He believes this is the essential basis of sympathetic ophthalmia, any grade of inflammation being developed by the addition of an infection.

[1] Trans. Amer. Ophth. Society, vol. xi, Part III.
[2] Klin. Monatsblätter f. Augenheilk., February, 1908, p. 202.
[3] La Clinique Ophtalmologique, February 25, 1908. [4] Practitioner, May, 1908.
[5] Archives d'Ophtalmologie, July, 1908.
[6] Berliner klinische Wochenschrift, 1908, No. 17.
[7] Graefe's Archiv f. Ophthal., lxix, Heft 3.
[8] Recueil d'Ophtalmologie, September, 1908, p. 416.

Partial removal of the exciting eye has been repeatedly followed by sympathetic inflammation of the other eye. Schieck[1] reports a case in which exenteration had been done following injury. After several months sympathetic ophthalmia occurred. On removal of the stump it was found to contain a remnant of uveal tissue, in which had occurred the typical changes associated with sympathetic inflammation. He points out that such a stump is more dangerous than the whole eyeball, because inflammation occurring in it would be much less likely to attract attention. In discussing Schieck's paper, Schmidt-Rimpler reported a similar case.

Gifford[2] reports a case of his own in which sympathetic ophthalmitis followed the implantation of a glass ball in the sclera. Seven months elapsed between the Mules' operation and the appearance of inflammation in the other eye. The stump was at once enucleated, and under treatment the eye became quiet, with vision almost normal. But six months later acute glaucoma supervened, and, in spite of iridectomy and sclerotomy, the eye grew worse until there remained a softened globe with doubtful light perception. The peculiar relapsing course of the disease, Gifford thinks, was due to the element of sympathetic inflammation.

Gifford also brings together from the literature, and from unpublished reports, cases, making 16 in all, in which sympathetic ophthalmia has followed Mules' operation. He also finds 9 cases after simple evisceration, and 3 after Frost's implantation in the orbit. The results in these cases were: vision $\frac{20}{30}$, or better, in 13; vision reduced, but useful, in 5; practically lost, 5; result unknown, 5. Gifford, after frankly admitting that his practice might not have been influenced much by this series of cases, if all had occurred in the practice of others, says: "But having had one of these accidents myself, I should feel like a criminal if I were to go on doing Mules' operation, or Frost's operation, and should have a second patient go blind after one of them; and I should throw over the simple evisceration also, if I did not believe it to be slightly less likely to cause death than enucleation is."

Treatment of Sympathetic Uveitis. The administration of large doses of sodium salicylate, 4 to 9 grams (60 to 135 grains) daily, has given Widmark[3] 8 striking successes out of 12 cases of sympathetic ophthalmitis, in which he tried this plan of treatment. In one case, although it seemed to do good, the eyeball finally became shrunken. In 3 cases it had no effect; 2 of these were cases of retinochoroiditis, which yielded to mercurial inunctions. Widmark attributes part of his success to the previous administration of sodium salicylate for the original inflammation in the exciting eye.

[1] Trans. Thirty-fifth Ophthalmological Congress, Heidelberg.

[2] Ophthalmic Record, November, 1908.

[3] Ophthalmic Review, September, 1908, p. 279.

Thomson[1] points out that *aspirin* is better borne than sodium salicylate —does not cause nausea, deafness, or tinnitus. He reports 2 cases the recovery of which he ascribes largely to aspirin. Gifford,[2] who was the originator of the treatment by large doses of salicylates, has tried the use of *atoxyl,* injected subcutaneously, in addition to salicylates and other treatment. He reports 2 cases, both of which improved under the use of atoxyl in a way that led him to ascribe benefit to that drug. He refers to the cases of blindness following its use in trypanosomiasis and syphilis, as a reminder that "atoxyl is a powerful poison, to be used with care."

GLAUCOMA.

Pathology of Glaucoma. From an elaborate microscopic study of the region of the root of the iris and the angle of the anterior chamber, Henderson[3] concludes that the primary and constant factor in glaucoma, and its predisposing cause, is a sclerosis of the "cribriform" (pectinate) ligament. This sclerosis, by narrowing of the meshes of the filtration space, causes a mechanical obstruction to the free access of aqueous to Schlemm's canal. The application of the root of the iris to the cornea, he believes, is due to dragging forward by the sclerotic changes, and not to pushing forward by the swelling or other alteration of the ciliary processes behind it. He thinks the intra-ocular pressure, like the intracranial, is purely circulatory in origin; and represents the capillary venous pressure in the eyeball, and more particularly the venous pressure within Schlemm's canal. In addition to the "cribriform ligament" at the periphery of the anterior chamber, the aqueous can be drained through the iris crypts and iris veins into the canal. Sclerosis of the ligament, as with age, throws more work on the iris crypts. If these are insufficient, the tension of the eyeball slowly rises. Dilatation of the pupil tends to close the outlet through the iris. With hampered outflow, rise of arterial pressure increases the intra-ocular tension. Rise in venous pressure reduces the escape of fluid; congestive edema of the iris tends to close the filtration space. Mydriatics close the iris crypts, and thus favor increased tension. Miotics are beneficial, as they open the iris crypts. They lose efficiency as the iris becomes degenerated. Iridectomy, Henderson thinks, depends for its success on opening a direct path from the aqueous to the iris veins. The cut surfaces of the healthy iris do not cicatrize, and the coloboma forms and remains a large crypt.

The obliteration of the angle of the anterior chamber, which gives rise to *increased tension,* after the formation of a corneal scar with

[1] Trans. Amer. Ophthalmological Society, vol. xi, Part. III.

[2] Ophthalmic Record, March, 1908.

[3] Ophthalmoscope, October, 1908.

anterior synechia, has been studied by Fuchs.[1] He finds that before perforation occurs the angle, although widely open, is often filled with lymph. Sometimes the iris had become adherent to the posterior corneal surface, through swelling of the parts and exudate. This process may seclude the angle proper of the aqueous chamber, so that it forms a ring-shaped canal. If perforation should not occur, the aqueous chamber will ultimately become free again. This, however, is not the case after perforation. Then the iris comes forward to the cornea, although at the extreme periphery they may still be separated by a lymph space. Hyperemia of the parts and falling forward of the ciliary processes, lens, and vitreous, assist in the process. The permanence of the adhesions thus formed, Fuchs thinks, depends upon loss of epithelium by the surfaces thus brought in contact. The extent of the adhesions, will determine the increase of tension. In 19 cases examined, all the eyes but one showed adhesion at some point. In spite of these adhesions, some cases continue a long time without increased intra-ocular tension. In one of Fuch's cases, with peripheral adhesion all around, this was so for thirty-eight years. The continuance of normal tension under these circumstances, he thinks, may be due either to the ring-shaped space at the periphery remaining free, or to the fact that the iris, being normal in structure, does not prevent the outflow of the aqueous.

Spontaneous Rupture of Eyeball. Villard[2] reports 3 cases of this termination to increased intra-ocular tension. In 2 the crystalline lens was expelled, and in the third the whole contents of the eyeball. Coppez,[3] who examined an eye removed nine months after such a rupture, believes that the rupture is brought about by preceding ulceration of the cornea. The cornea gives way; and the sudden lowering of intra-ocular tension is followed by profuse hemorrhage, which accumulates behind the choroid, extends the rupture, and, when it has become large enough, pushes the lens through it.

Danger of Delay in Glaucoma. A striking instance of the terrible results from failure to recognize glaucoma, and promptly resort to its efficient treatment, is reported by Randolph.[4] A healthy farmer began to suffer glaucoma pain Saturday morning, and his family physician diagnosticated la grippe, and prescribed accordingly. By Sunday evening he could see nothing, and Monday morning light perception was gone. It never seemed to occur to his physician that he was suffering from glaucoma; but he was assured that his sight would return as soon as the la grippe had left him. He was permitted to suffer great agony for a week. Then iridectomy was done. "The relief was almost instantaneous." But the patient remained blind with deep cupping and atrophy of the optic disks. Probably recognition of his condition and operation within the

[1] Ophthalmoscope, October, 1908.
[2] Archives d'Ophtalmologie, December, 1908.
[3] Ibid., October, 1908.
[4] Ophthalmic Record, January, 1909.

first two days would have restored his sight. Glaucoma is liable to arise in the course of la grippe. But this does not lessen the danger of it or excuse the failure to recognize it.

Treatment of Glaucoma. The operation of cyclodialysis, previously described,[1] has not been widely adopted, but Wernicke[2] believes it is to be preferred to iridectomy in many cases, and is as valuable in others. He reports on 76 operations done on 61 patients in Uhthoff's clinic. On 6 patients both eyes were operated on, and in 9 cases the operation was repeated on the same eye. In 57 per cent. there was improvement, which lasted as long as the case continued under observation. In 25 per cent. the improvement was temporary. In 18 per cent. there was no improvement after a first operation; but in one-half of these cases improvement followed a repetition of the cyclodialysis, so that only 9 per cent. showed no improvement. Among the 61 cases there were 4 of hemorrhagic glaucoma, in one of which the eye remained free from pain or increased tension. In 2 the operation did no good, and in the fourth there seemed to be benefit, but the patient passed immediately from under observation.

Meller,[3] from an examination of 42 cases, concludes that cyclodialysis gives permanent relief in 40 per cent., temporary relief in 30 per cent., and fails to improve in 30 per cent. In successful cases the reduction of intra-ocular tension is not noticeable until the next day; but all hypertension disappears by the third day at least, and sometimes the tension becomes subnormal. If relief is only temporary, the tension rises again within a week. The results are especially favorable in secondary glaucoma, following anterior synechia, subluxation of the lens into the vitreous, or cataract extraction. Meller thinks the operation is indicated where iridectomy would be especially dangerous or difficult. From experiments on dogs, Joudine[4] concludes that Hiene's claims for cyclodialysis are not supported. That it will not replace iridectomy, but may serve as a temporary operation to render subsequent iridectomy easier.

Operations to Produce Permeable Scars. From the early days of iridectomy for glaucoma, it has been known that what was termed a cystoid scar, one which after incarceration of the iris never became firm and flat, was an especially reliable safeguard against recurrence of increased intra-ocular tension. Within the last year various operations designed to produce scars through which the aqueous might escape into the subconjunctival space have attracted a good deal of attention. Herbert[5] attempts to accomplish this desired object in connection with iridectomy.

[1] PROGRESSIVE MEDICINE, June, 1908.
[2] Klinische Monatsblätter f. Augenheilk., November to December, 1908.
[3] Graefe's Archiv f. Ophthalmologie, lxvii, Heft 3.
[4] Wiestnik Ophthal., March, 1908.
[5] British Medical Journal, September 12, 1908.

In making the corneal incision with a Graefe knife, he turns the knife forward, making it cut almost through the sclera; then restoring it to its original direction, he completes the incision. This leaves a wedge-shaped piece of sclera isolated, except through a narrow bridge and its connections with the conjunctiva. This wedge-shaped piece subsequently atrophies, leaving a thinned place, if not an actual opening in the sclera, under the conjunctiva, which is more or less permanent.

Lagrange,[1] making the incision in the limbus for iridectomy or sclerotomy, plans that it shall emerge obliquely, forming a rather long, tongue-shaped anterior flap, reaching back in the sclera. After completing such an incision he separates the conjunctiva from it, and cuts off this flap with scissors, removing enough tissue to leave a very thin place, or an actual opening in the sclera. Bettremieux[2] attempts to accomplish the same thing without opening the eyeball, by making the incisions from the outer surface, and removing a piece of sclera. Herbert and Lagrange have demonstrated, on series of cases, that after their operations the scar remains so permeable to aqueous that pressure on the eyeball can force out fluid and cause prominence of the conjunctiva over the region of the scar.

In a considerable number of cases, now reported by several operators, such scars seem to have secured permanent diminution in the tension. But in some cases the tension was not reduced; and in some the reduction was not permanent. Such operations are not likely to replace iridectomy for acute glaucoma. But in the performance of iridectomy or sclerotomy these steps can easily be added; and possibly they may prove serviceable in chronic glaucoma, for which iridectomy is not so satisfactory.

THE CRYSTALLINE LENS AND VITREOUS.

Diabetic Cataract. The dangers of cataract extraction in a patient suffering from diabetes are generally appreciated by surgeons; perhaps are rather overestimated. Kitamura[3] has studied the results in 112 cases of diabetic cataract operated on in the course of ten years at Uhthoff's clinic: 90 extractions with iridectomy, 14 without iridectomy, and 8 simple linear. He finds that good vision, of $\frac{1}{3}$ or better, was obtained in 68 per cent., and vision better than $\frac{1}{10}$ in 13 per cent. more, making 81 per cent. of what would be judged, by the old standards, good results. Six patients were able to count fingers at different distances up to 6 meters. Two others were able to see hand movements. However, hemorrhages into the retina and vitreous were relatively frequent, and iritis was four times as common as among patients free from diabetes.

[1] Archives d'Ophtalmologie, February, 1908.

[2] Annales d'Oculistique, May, 1908, p. 385.

[3] Klinische Monatsblatter f. Augenheilk., June, 1908.

Discission of Cataract in Adults. The age limit up to which it is wise to undertake the removal of the cataract by discission is a subject of general interest. Many of the books set it at fifteen years, although traumatic cataracts going on to complete absorption in adults are not very rare. Post reports 2 cases in which he needled cataracts at thirty-five and thirty-seven years of age, with satisfactory results. Vision was obtained of $\frac{20}{20}$ in one, and $\frac{20}{48}$ in the other, to be improved by division of a membrane. In the latter of these cases but a single needling was done, and the absorption of the lens was practically complete within nine months. Post also publishes a case of Dr. John Green's,[1] in which 4 discissions brought about complete clearing of the lens, after the age of forty-one, without any sign of iritis or other complication.

Hemorrhage into Vitreous. Recurring hemorrhage into the vitreous in young persons is a rare condition, but extremely dangerous to sight. Krauss[2] reports a case in which six hemorrhages occurred into the right eye in the course of two and one-half years. Yet after the last vision rose to normal, although there were numerous opacities in the lower part of the vitreous, Krauss thinks that the absorption of toxins from the intestinal tract, incident to long-continued constipation, may be a factor; although he thinks local vascular degeneration in the capillaries of the choroid probably exists. Gehrung[3] reports 2 cases: one of the patients, a woman who had a single small hemorrhage, recovered completely; the other patient was a man in whom the hemorrhage followed a wound in the temple, which did not injure the eyeball. The hemorrhage recurred spontaneously, and when last noted vision was reduced to light perception. M. Landoldt reports a case of hemorrhage recurring nine times within four years. The patient was a woman, and each hemorrhage occurred at the menstrual epoch, or associated with some effort or emotion. The ages of these patients ranged from twenty-six to thirty-two years.

The treatment of this condition has been extremely unsatisfactory. Kyrieleis[4] reports a case of recurring hemorrhage in a healthy, full-blooded man, aged nineteen years. The left eye had become totally blind from relapsing hemorrhages, and the right seemed doomed. Kyrieleis resorted to venesection, which was practised five times at intervals of eight to ten days, taking 250 grams of blood each time. The patient was also kept in bed and given potassium iodide. Following the treatment there had been no recurrence of hemorrhage in seven years. But a year after the last hemorrhage, when vision had risen to $\frac{1}{10}$, a detachment of the retina occurred. Under venesection, pressure bandage, injections of salt solution, and cauterization of the sclera the

[1] American Journal of Ophthalmology, February, 1909.
[2] Annals of Ophthalmology, January, 1908.
[3] New York Medical Journal, December 19, 1908.
[4] Klinische Monatsblätter f. Augenheilk., May, 1908.

retina was reattached, and fingers could be counted at two and one-half meters. There was an extensive membrane in the vitreous.

Ligature of the common carotid has been tried for this condition. Vasquez-Barrière[1] reports 2 cases and quotes in abstract the 2 previously reported. In 3 of these 4 cases the results were good. In Mayweg's case, eighteen months after the operation vision was $\frac{20}{50}$ and $\frac{20}{40}$. In Axenfeld's first case one eye had been removed before the carotid was tied to save the other, and vision in the latter rose to $\frac{6}{12}$ at the end of twenty-six months. In the third case, six months after operation, the patient could count fingers at $1\frac{1}{2}$ meters with the right eye, and had vision of $\frac{6}{9}$ with the left, the visual field being concentrically contracted. In Derby's case the hemorrhages had recurred in both eyes for about one year. The right common carotid was tied, and the right eye began to improve. But in three weeks a hemorrhage recurred, and vision at the end of four months was not improved; it remained counting fingers at one foot, and hand movements.

THE RETINA, OPTIC NERVE, AND CENTRES.

Night Blindness. Parsons[2] concludes that the congenital forms of night blindness are closely allied with that which occurs in retinitis pigmentosa. Acute night blindness is associated with defective nutrition, whether it occurs with ocular disease like xerosis, or with scurvy, malaria, anemia due to defective diet, or jaundice. He accepts the hypothesis of some deficiency in the rods or of the visual purple. Hess,[3] from his study of a series of cases of night blindness, of varied origin, concludes that in all cases in which the retinal rods are defective the cones also suffer; that the dark adaptation of the rod-free centre of the macula is also impaired. Mallamnah,[4] from his acquaintance with *acute* night blindness, concludes that it depends upon deficient alkalinity of the blood; and that it is easily cured by the internal administration of urotropine. He considers this a specific. Most of his cases get well completely within a week.

Nettleship has placed on record an account of the Nougaret family, including 2120 persons, of whom 135 were known to have been affected with *congenital stationary night blindness*, which had been transmitted through nine generations. Bordley[5] records the history of a colored family, the Gibsons, in which the night blindness was congenital, but progressive. He has traced it through five generations, including 43 persons, of whom 35 were affected. It affected both males and

[1] Klin. Monatsblätter f. Augenheilk., January, 1908.

[2] Lancet, February 22, 1908. [3] Archiv f. Augenheilk., lxii, Heft 1.

[4] Annals of Ophthalmology, April, 1908.

[5] Johns Hopkins Hospital Bulletin, vol. xix, No. 210.

females, and was always transmitted by those who suffered from the defect. The visual fields which were examined in 7 patients, besides great narrowing by diminished illumination, all showed complete loss of the lower temporal quadrant. As the patients grew older the visual fields became more restricted, until they became entirely blind. The blindness was soon followed by death; not one had lived over sixteen months after becoming blind.

Obstruction of Retinal Arteries. Sudden blindness in one eye, with interruption of the circulation of the blood in the retina, is no longer ascribed in all cases to embolism. In a large proportion of cases the vascular lesion is probably a thrombosis. Reporting a series of 5 cases, de Schweinitz and Holloway[1] do not attempt to decide whether or not the process was embolic, although in 2 of their cases the evidence points that way. In one case the complete absence of blood from the arteries when the eye was first seen, thirty minutes after the attack, and the restoration of the arteries after deep massage of the eyeball, might be taken to indicate that the condition was rather one of arterial spasm than one of obstruction of the vessel by a clot. Shoemaker,[2] who observed what he thought to be an embolism of the artery supplying the macula, was able to secure a microscopic examination of the eyeball, removed immediately after death, eleven days later. This showed, in addition to obstruction of the macular artery, which might have been thrombotic, but which he judged to be due to embolus, the presence of thrombi in the superior and inferior retinal arteries.

Ridley[3] reported a case of sudden loss of vision in one eye, with the retinal arteries reduced to mere threads, followed by gradual restoration of the normal appearances of the vessels and some vision. This case he regards as one of *thrombosis*. On the other hand, Hesse[4] reports a case, with photographs of the fundus taken with the apparatus of Dimmer at Gratz, in which an embolus was shown obstructing a main branch of the retinal artery, and afterward moving on to one of the smaller branches. A case of true *embolism* is also reported by Früchte.[5] The patient was suffering from a malignant endocarditis with miliary infarcts throughout the body; and postmortem a hyaline plug was found partly filling the central retinal artery, just back of the lamina cribrosa, the vessel being in other respects entirely healthy.

Hosmer, who made the pathological examination of Shoemaker's case, states of the retinal changes: "The process amounts to ischemic necrosis." Hancock,[6] in a careful discussion of the nature of the *retinal opacity* observed in this condition, reaches the conclusion that the retinal

[1] Trans. Amer. Ophth. Society, vol. xi, Part III.
[2] Ibid.
[3] Ophthalmic Review, August, 1908.
[4] Zeit. f. Augenheilk., May, 1908.
[5] Klinische Monatsblätter f. Augenheilk., March, 1908.
[6] Royal London Ophthalmic Hospital Reports, vol. xvii, Part III.

haze is probably not due to edema, as has been generally supposed, but to a necrosis of the superficial layers of the retina, probably the "coagulative necrosis" of Cohnheim.

Hancock has also brought together the previously reported cases, to which he adds 2 of his own and 9 furnished by Nettleship, 25 in all, in which, with obstruction of the main trunk of the central artery and general blindness, there remained slight vision in some part of the field. In these cases the ophthalmoscopic observations indicated that the interruption of the retinal circulation was complete. The part of the field in which some vision was preserved was: temporal, 21; eccentric, 1; upward and inward, 1; in one case hand movements could be perceived, and in one there was light perception in other parts of the periphery, with counting fingers in the temporal field. Hancock points out that the preservation of the temporal field at the extreme periphery is probably due to the fact that the extreme peripheral portion of the retina is nourished, not by the retinal vessels, but by the capillaries of the choroid. The temporal field is commonly preserved alone, because it is only in this direction that the field extends far enough to correspond to the extreme peripheral part of the retina. Hancock does not deny that anastomotic branches at the optic disk might preserve the function of the adjoining retina, giving an island of vision immediately around the normal blind spot, although none of his cases presented this phenomenon. But in one of the cases reported by de Schweinitz and Holloway, just such a small field surrounding the blind spot was preserved, although light perception was lost in all other portions.

Retinal Angiopathies. The essential relation of vascular lesions to certain degenerative changes in the retina has received important recognition in the work of Wilbrand and Saenger.[1] They bring together under the general heading of retinal angiopathies the degenerative conditions that have been known as *albuminuric retinitis*, *diabetic retinitis*, *leukemic retinitis*, chronic inflammatory and degenerative changes due to *syphilis*, and the more acute conditions that arise from *sepsis*. The importance of the vascular lesions of cerebral syphilis have long been recognized. The fact that vascular changes precede and underlie the longer known lesions of chronic nephritis is becoming to be generally understood. But the shares of vascular lesions in the pathology of leukemia, diabetes, and sepsis are not so evident. In the retina, where microscopic changes can be watched during life, these pathological problems are best to be worked out.

Retrobulbar Neuritis. The importance of this condition as a very early sign of *multiple sclerosis* is urged by Fleischer.[2] He took from the records of Schleich's clinic 30 cases of idiopathic acute retrobulbar neuritis, in which there was no probability of the inflammation arising by

[1] Neurologie des Auges, 1909, vol. iv.

[2] Klinische Monatsblätter f. Augenheilk., February, 1908

extension, or by any form of poisoning, and made careful inquiry as to their subsequent history. In most of them symptoms of multiple sclerosis subsequently developed. In a few, such symptoms had preceded the neuritis. But in others long intervals elapsed before other evidences of sclerosis were noticed. Among these cases were 12 in which there was marked ophthalmoscopic evidence of optic neuritis, and in 5 of these multiple sclerosis developed. Fleischer believes that the occurrence of retrobulbar neuritis in early life, without other discoverable cause, indicates with great probability the subsequent development of multiple sclerosis. Bagh[1] has taken up the study of this question in Uhthoff's clinic, and records 4 cases in which retrobulbar neuritis antedated multiple sclerosis, in one case by as much as ten years. While he thinks Fleischer's conclusion, that sclerosis will develop in 90 per cent. of the cases, puts the percentage too high, he believes that the proportion shown by statistics from Scholer's clinic, 16 per cent., is altogether too low.

Balint[2] found that among 22 cases of retrobulbar neuritis, 12 were due to alcohol, 6 to tobacco, and 4 to these two causes combined. On investigation he found that other *sensory nerve roots* had suffered, especially the last cervical, and first, third, fourth, and fifth dorsal. He concludes that retrobulbar neuritis is not simply a local disease of the optic nerve, but is an evidence of systemic disease, which probably involves the other sensory nerves. If this be the case, it would seem worth while to investigate the connection which the known causes of retrobulbar neuritis may have with lesions of the sensory roots of the spinal nerves.

Six cases illustrating the optic nerve changes in multiple sclerosis are reported by Holden.[3] He finds that disturbances of vision occur at some time in about one-half the cases of multiple sclerosis, and that more than one-half of these patients who complain of failing sight have central scotoma, due to retrobulbar neuritis. In his opinion we shall soon come to the belief that non-toxic retrobulbar neuritis, not due to sinusitis, syphilis, diabetes, neoplasm, or trauma, is, as a rule, a manifestation of multiple sclerosis, although no other symptoms may be present.

The share of *sinus disease* in the production of retrobulbar neuritis is illustrated by a case reported by Rethi.[4] Vision was greatly impaired in both eyes, when evacuation of the ethmoid through the nose was followed by almost immediate improvement, and ultimately full vision was restored to the right eye, while great improvement took place in the left.

Toxic Amblyopia. After two injections of *iodoform* emulsion, each containing nearly an ounce of iodoform, for psoas abscess, Sarafoff[5]

[1] Klinische Monatsblätter f. Augenheilk., July, 1908.
[2] Zeitschrift f. Augenheilk., September, 1908, p. 263.
[3] Trans. Sec. on Ophth. Amer. Med. Assoc., 1908.
[4] Med. Klinik, 1908, No. 16.
[5] Woch. f. Therap. u. Hyg. d. Auges, January 9, 1908.

saw the vision reduced to counting fingers, with central scotoma from retrobulbar neuritis. Subsequently the scotoma disappeared, and the patient regained normal vision. Rochon-Duvigneaud[1] reports a case in which the disturbance of vision followed a single injection, containing about 100 grains of iodoform, into a psoas abscess. The failure of vision began about the thirty-seventh day. There was narrowing of the color fields and central scotoma, and vision was reduced to counting fingers at $1\frac{1}{2}$ meters.

A case of amaurosis due to *filix mas* is reported by Schoening,[2] who quotes the statistics of Nieden, that in 81 poisonings by this drug there were 12 deaths, 19 cases of bilateral blindness, 15 cases of blindness of one eye, 13 of permanent diminution of vision, and 2 in which impairment was temporary. Schoening's patient was a healthy man, who received 10 grams (150 grains) of extract of filix mas at a dose. This was repeated three days later, followed by calomel and jalap. Next day, after the second dose, the vision was lost. Seven hours after the onset of amblyopia the pupils were widely dilated, there was no light perception, the retinal arteries were contracted, and the veins large. Light perception returned on the fourteenth day, and after six months the left eye had regained vision of $\frac{1}{200}$, but the right eye remained blind.

The danger of blindness from the use of *atoxyl* was referred to last year. Morax[3] has collected 13 cases that have been reported in some detail, in which the ultimate vision varied from $\frac{5}{7}$ to complete blindness. The dose producing unfavorable symptoms appears to be quite variable. The impairment of vision comes on suddenly, and often continues to increase in spite of treatment. Igersheimer has studied the action of atoxyl by experiments on rabbits, dogs, and cats. Injected into the aqueous it caused no harm, but small doses in the vitreous produced necrotic changes in the nerve elements of the retina. Given internally, it produced pathological alterations in the ganglion cells of the retina and in the central nervous system. In discussing Igersheimer's paper, additional cases of blindness following treatment with atoxyl were reported by Dor, Krüdener, and Wolfrum.[4] It is clear that the rule of not going above 0.5 gram as the maximum dose should be rigidly adhered to; but blindness seems to have followed smaller doses when too often repeated.

LACRYMAL APPARATUS, LIDS AND ORBIT.

Extirpation of Lacrymal Sac.—The treatment of chronic lacrymal obstruction, with grave dacryocystitis, has often been a source of dread to the patient, on account of the pain attending it, and to the surgeon, on

[1] Recueil d'Ophtalmologie, November, 1908, p. 501.

[2] Zeit. f. Augenheilk., March, 1908. [3] Annales d'Oculistique, January, 1908.

[4] Trans. Thirty-fifth Ophth. Cong., Heidelberg.

account of the indefinitely protracted treatment required by the older methods, the tendency to relapse, and the uncertainty regarding the ultimate result. This being the case, it is not surprising that the operation of extirpation of the lacrymal sac has grown rapidly in favor. For it affords relief by a single operation, performed under general anesthesia, followed by healing within a reasonable period and a certain and permanent result. Elliot[1] illustrates its increasing popularity by the figures from the Madras Hospital for three successive years, 47, 98, and 125 cases respectively. He reports 310 consecutive operations upon 235 patients. The indications for it are dilatation or purulent contents of the sac, evidence of previous abscess with persistence of stricture, long-standing lacrymal obstruction, with inability or unwillingness of the patient to have it treated long enough by probes, the need for an operation on the eyeball, especially cataract, or the presence of a septic ulcer of the eye, or a special danger of injury of the cornea by foreign bodies, with existing lacrymal obstruction, and bilateral obstruction with damage to one cornea.

The operation is one of some difficulty, and not to be undertaken except by one familiar with surgery of the parts. It is not easy to be sure that the whole sac has been removed; and some of the accompanying conditions, as septic ulceration of the cornea, require careful handling. The value of experience is shown by Elliot's statistics. His fourth case was the only one in which there was recurrence, because part of the sac had been left behind. And while one of his earliest operations took fifty minutes, the average for the last 150 operations was 9.5 minutes, and the shortest time 4.5 minutes. With regard to the inquiry often made, as to what becomes of the excessive lacrymation after removal of the sac, Elliot says: "The extirpation of the sac is practically invariably followed by an immediate diminution of lacrymal secretion, and this happy result appears to be permanent."

The results of 58 extirpations, performed on 52 patients, are described by Kuinders.[2] In 50 there was healing by first intention. Of the 41 patients who replied to inquiries, 28 stated that the eye did not tear indoors, 6 that it teared a little, and 7 that it teared. Outdoors, when the wind was blowing, 40 said there was tearing, 34 stated that the tearing was improved by the operation, 5 that it remained the same, and 2 that it became worse. None of the 52 patients found their condition so troublesome that he wanted to undergo extirpation of the lacrymal gland.

Gangrene of the Lids. Cases of gangrene of the lids occurring in adults were noted last year. We have now a group of reports of the same condition affecting infants. In Francke's[3] case, a child of healthy

[1] Ophthalmic Review, February, 1908.

[2] Ophthalmology, October, 1908, p. 121.

[3] Klinische Monatsblätter f. Augenheilk., October, 1908.

parents seemed quite well until fourteen days old, when a dark bluish spot appeared on the left lower lid. A few days later a similar spot appeared on the right upper lid. When seen two weeks afterward each lid presented on the skin surface an ulcer with a gangrenous base. The conjunctiva was but moderately hyperemic. Under treatment the ulcers healed, in the right lid in two weeks without deformity, in the left lid in about three and one-half weeks with great ectropion. There seemed to have been no acute infection to which the child was exposed, and Francke ascribes the trouble to the excessively cold, damp dwelling, the case having occurred in January and February.

In Bergmeister's[1] case the infant was suffering from ophthalmia neonatorum, which was neglected, and attended with great swelling of the lids. Streptococci as well as gonococci were present. Gangrene of all four lids, in a newborn infant suffering from congenital syphilis, is reported by Tertsch.[2] Stoewer[3] saw lid gangrene in a three-year-old girl, just recovering from measles. The process started in an ulcer, the size of a grain of barley, on the margin of the lower lid. Two days later the lid was greatly swollen, blackish blue externally, and from the conjunctival surface there was a continuous oozing of blood, and the base of the ulcer became necrotic. The bleeding from the conjunctiva continued nearly a week; then there was rapid improvement in all respects. A mass of tissue 6 or 7 mm. long extending through the whole thickness of the lid necrosed, leaving a moderate deformity of the lid margin. Cultures showed only the yellow staphylococcus.

Cavernous Sinus Thrombosis. Thomson[4] points out that the causes of thrombosis of the cavernous sinus are chiefly found in diseases of the nose and ear, but the symptoms are more prominent and distinctive in the eye. He believes that disease of the sphenoidal sinus is the most common cause, although unrecognized; and next to that, pyogenic infections of the ear. Of 28 recent cases which I[5] have collected, sinus thrombosis was associated with disease of the middle ear and mastoid in 13, scarlet fever in 3, feeble circulation in 1, and in the other cases it was ascribed to abscesses or suppurative disease of other parts of the face and head, but no mention of the sphenoidal sinus.

The mistake is usually made of regarding this condition as erysipelas, or even as purulent ophthalmia. Great swelling and other evidences of venous stasis in the orbit and lids are the prominent features. The condition tends to become bilateral, and involvement of both orbits is very significant, making clear the diagnosis from orbital inflammations. In one of the reviewer's cases there was first swelling of the right cheek, and later exophthalmos of the left eye; and Thomson gives a case,

[1] Zeitschrift f. Augenheilk., April, 1908, p. 386.
[2] Ibid., p. 387.
[3] Klinische Monatsblatter f. Augenheilkunde, July, 1908.
[4] Ophthalmic Review, October, 1908.
[5] Ophthalmology, January, 1909.

involving principally the right eye, where the infection came from the left ear. This crossing over of disease points strongly toward the cavernous sinus.

OCULAR INJURIES.

Self Mutilation. Vasioutinski[1] has studied these among the military recruits of Russia. Most frequently they involve the conjunctiva and cornea. They are produced with quicklime, ammonia chloride, silver nitrate, potassium permanganate, soap, tobacco, acids, etc. A peculiar yellowish brown opacity of the cornea was noticed 44 times among 11,000 recruits. By experimental study he came to the conclusion that these lesions were produced by cauterization with the crayon of silver nitrate. Henderson[2] reports the case of a Sister in one of the religious orders, seen with three recurrences of conjunctivitis produced by burns, probably with carbolic acid. Each attack was worse than the one preceding, and the last caused an adhesion of the lower lid to the eyeball, extending up to the cornea. On being accused of causing her trouble, and watching her, the attacks ceased. Doret's[3] patient placed the ends of matches in the conjunctival sacs, and claimed that the resulting inflammation was due to the ammonia she used in washing floors. Injuries from attempts to tear out the eyeballs, on the part of insane patients, Badal[4] finds more frequently occur in women.

Electric Ophthalmia. Eight cases of this condition produced by one accident are reported by Coullaud.[5] The men were compelled to work at 0.5 to 2 meters from the electric arc, caused by the short circuit of a 500 volt current between two large cables. The exposures lasted from five to forty minutes. A bluish glare was noted immediately afterward, but symptoms of irritation only began after periods varying from seven to twenty hours. Then there was pricking of the conjunctiva, feeling of a foreign body, and intense photophobia, blepharospasm, and lacrymation. The vision was somewhat reduced in about one-half the eyes. In the more severe cases the ophthalmoscope showed dilated veins and slight haziness of the retina. Recovery took place in from one to ten days, the cases in which the symptoms appeared earliest being the most severe and the last to recover. Sweet's[6] patient was sawing through a cable carrying a 500 volt current, when the current was unexpectedly turned on. The eyebrows, lashes, and skin of the lids and face were scorched. The lids became swollen, conjunctivas inflamed, and the corneas opaque. One eye recovered promptly; the other relapsed

[1] Annales d'Oculistique, July, 1908, p. 76.
[2] American Journal of Ophthalmology, October, 1908.
[3] Recueil d'Ophtalmologie, August, 1908, p. 370.
[4] L'Opht. Prov., June, 1908. [5] Arch. d'Ophtalmologie, January, 1909.
[6] Trans. Sec. on Ophth. Coll. Phys., Philadelphia, March 19, 1908.

several times, owing to injury to the corneal nerves and resulting insensibility of its surface. Le Roux and Renaud[1] record the case of a patient whose sight was injured by a stroke of lightning, although he gave no other evidence of shock. At the end of three years he still suffered from severe photophobia, clouding of the vitreous, and dilatation and feeble reaction of the pupils, vision being reduced to $\frac{1}{2}$ and $\frac{1}{3}$.

HEREDITARY BLINDNESS.

Loeb,[2] from the literature and 152 replies received to a circular letter sent to ophthalmologists and institutions of the blind, has collected statistics regarding hereditary blindness, and formulated plans for its prevention. The following hereditary conditions are studied with reference to heredity: albinism, absence or coloboma of iris, anophthalmos and microphthalmos, optic atrophy, cataract, ectopia lentis, family degeneration of the cornea, glaucoma, megalophthalmos, nystagmus, ophthalmoplegia and ptosis, and retinitis pigmentosa. The statistics include six families in which *both parents* were blind, and in which 17 out of the 31 children suffered from the same conditions. There were 1198 families in which one parent was blind, having 4124 children. Among these, 2506 children were affected. By direct heredity, from blind parent to child, 57.5 per cent. suffered; by indirect heredity, inheritance through a seeing parent from some more remote blind ancestor, 58.7 per cent. suffered. Among the families in which related persons of the same generation are similarly affected, without being able to trace it to a blind ancestor, 66.4 per cent. of the children were affected. These percentages seem very high; and may be abnormally so, on account of the manner in which the statistics were collected, striking instances of heredity being more generally reported. But they show that for certain causes of blindness heredity is a very important factor.

Loeb believes that of all cases of blindness, 10 per cent. are hereditary, and urges, both for economic reasons and to prevent future suffering, that the marriage of persons suffering from blindness, due to conditions that are likely to be inherited, should be prevented by education and by a prohibitory legislation. Loeb would have applicants for license to marry prove their vision by both signing the application in the presence of the clerk. The license should be withheld, in a case of blindness, until it was certified by a reputable oculist that the cause of the blindness was non-inheritable. Most causes of hereditary blindness operate before the age for marriage, but tendencies to senile cataract and glaucoma it might be impossible thus to guard against.

[1] Archives d'Ophtalmologie, June, 1908.

[2] Annals of Ophthalmology, January, 1909

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